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A Monthly Journal of Engineering Progress

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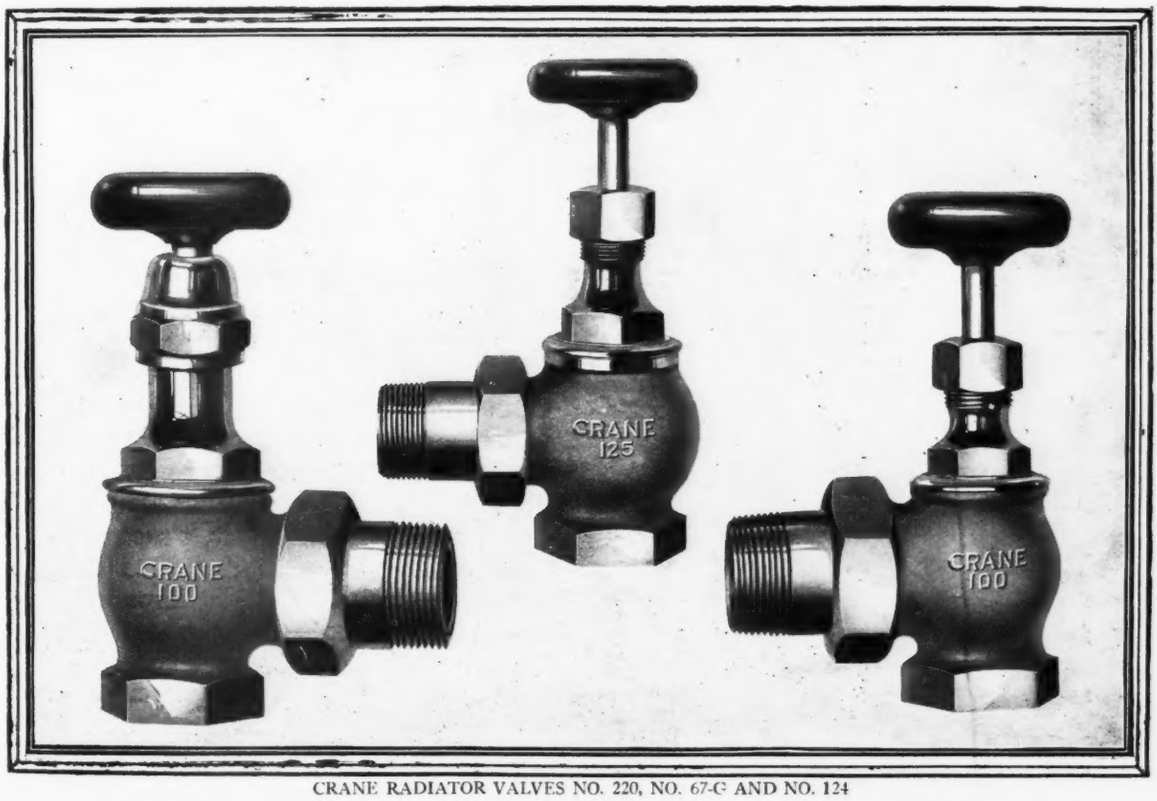

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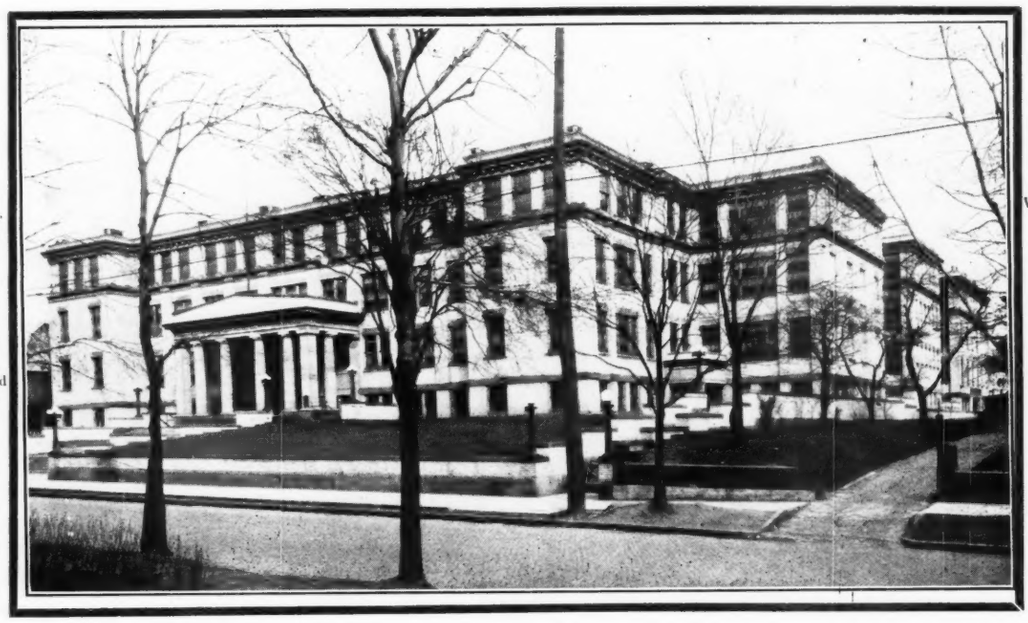

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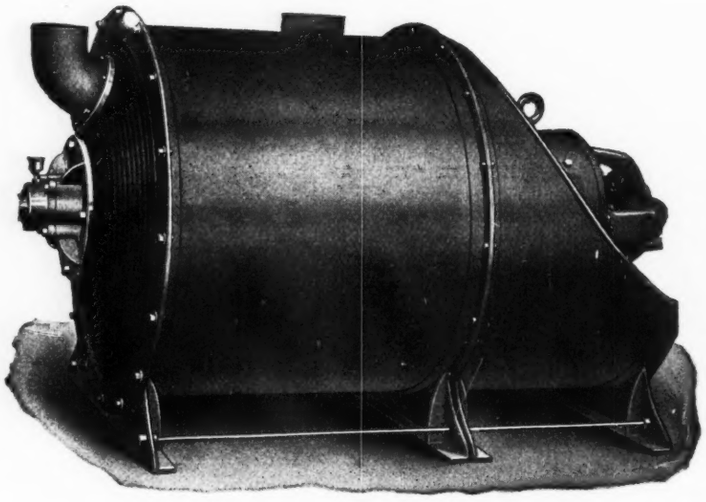

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APRIL, 1923

Cast-Iron Versus Steel Boilers

A Frank Comparison of Their Characteristic Features With Special Reference to Their Ratings

By Samuel R. Lewis

Consulting Engineer

A CORRESPONDENT of THE HEATING AND VENTILATING MAGAZINE asks for reliable data on relative investment, upkeep and operating costs of steel and cast-iron boilers. He wants "unbiased information."

I am not going to show any bias if I can help it. I do not think any real engineers who are unbiased have much difficulty in deciding which type of boiler to use for any specific installation. I think to unprejudiced engineers (wonder if there are any?) there are few borderline cases in which the decision is close.

It is, of course, difficult to deliver and unwise to publish any figures as to relative boiler efficiency as expressed in fuel and repairs. Either kind, well cared for, may be efficient, and either kind will last indefinitely. The same conditions which cause repair expense on one will cause repair expense on the other.

I do not think there is any real competition between cast-iron boilers and steel boilers. One simply isn't adapted to situations which suit the other, any more than a flivver and a five-ton truck are adapted to the same work.

No one knows all of the things which are necessary to be considered in designing a boiler, but here are some of the things which must be considered:

1. GRATE AREA

Of course you must have grate enough to burn enough coal to do the work. Steel heating boilers have nearly always been designed with a ratio of something around 1 sq. ft. of grate surface to 35 sq. ft. of heating surface. Every time you see a steel boiler rating changed you see a different heating surface and a different grate area.

With cast-iron boilers, as a general thing, it is not so easy to change the grate area in exact proportion to other changes, and it has come to be a trade custom to put in a very large grate in proportion to the heating surface, often with a ratio like 1 sq. ft. of grate surface to 13 sq. ft. of heating surface, which means nearly three times as much coal-burning capacity for each foot of heat-absorbing surface as there is provided in the usual steel boiler.

The rate of combustion for residence heating should be slow, so that one could put in coal before leaving home in the morning and have it last all day.

2. HEATING SURFACE

When you burn fuel and generate heat, that heat has to be absorbed into the circulating and distributing medium—water and steam usually. There must be enough water-cooled surface in contact with the combustion and its products to absorb all of the heat that can be spared from the necessary service of heating the chimney.

Area of heating surface has no essential relation to area of grate surface, but bears a very definite relation to the amount of heat liberated or the amount of fuel burned. It becomes a factor of the rate of combustion. Steel boilers of conventional type, with their 35 sq. ft. or so of heating surface per square foot of grate, can absorb nearly all the available heat from all the fuel we can burn, no matter how hard we stoke, and are, therefore, adaptable to public buildings, or buildings which have intermittent service.

Many cast-iron boilers have only 13 sq. ft. or so of heating surface per square foot of grate. If we compel such a boiler to burn all the fuel we can stoke, we

find red-hot breechings and overheated heating surfaces, causing surging, broken sections, and general trouble.

Ratings of steel boilers are very consistent at about 10 sq. ft. of radiation per square foot of heating surface. Ratings of cast-iron boilers are notoriously inconsistent, being based apparently on something else than heating surface. Perhaps in a generous mood we may suggest that they are more nearly based on the amount of anthracite coal which the manufacturer hopes can be burned under ideal conditions in a laboratory, ignoring every other consideration.

3. STEAM-LIBERATING SPACE.

Steel boilers are nearly all provided with a large surface of water exposed to a good-sized steam storage area, so that the bubbles of steam, which are decidedly violent, have a chance to disengage themselves from the water. Much of the steam has to force its way through several feet of water, and if you don't believe that the water is agitated, look inside a boiling teakettle. The steam in a boiler doesn't swirl lazily up from the quiescent water like vapor from a lake on a September morning.

The designers of the earlier cast-iron boilers had no thought of this interesting phenomenon, and we find little appreciation of it even to-day, and the contractor is urged to connect up with great big pipes all of the steam outlets provided, into a great big leader.

That's one of the reasons why I say there is no competition between the types, for one furnishes a steam separator and reservoir, while the other makes it necessary to supply these essential features at an extra price.

4. WATER CONTENT.

When we burn a concentrated fuel under perfect control, we can use a flash boiler satisfactorily. When we burn coal for power production with automatic stokers we can use flash boilers satisfactorily, because high-efficiency continuous combustion is assured.

When we burn coal or a similar fuel for heating, with hand-firing, having intermittent fuel introduction and clinker removal, we always have complaint from a flash boiler. Water-tube boilers for hand-fired heating services are not popular or pleasing unless some arrangement is provided for heat storage against the inevitable periods of low efficiency.

The usual steel boiler has a rather large volume of water, and the storage of heat in this water serves admirably to tide over emergencies.

The usual cast-iron boiler is essentially a water-tube boiler, having small relative water content. This is not an objectionable feature for residence heating, but explains why, if we use cast-iron boilers for heavy duty with continuous hard firing, we nearly always have trouble unless we ignore the manufacturer's rating and put in enough heating surface to do the work. Then we find it advantageous greatly to reduce the manufacturer's grate area and greatly to increase the manufacturer's suggested chimney height. In other words, provided we use about the same areas, it does not matter whether we use steel or cast-iron. If we want cast-iron boilers to do the work to which steel boilers of usual type are adapted, we must build them to steel boiler proportions. If we want steel boilers to do the work to which the usual type of cast-iron boiler is adapted, they will do so, though if selected on the basis of grate area they may be larger than necessary for the purpose in all other particulars.

A sectional cast-iron boiler having vertical sections is really a confederation of a number of small boilers. Each section is practically a duplicate of the others as to steam-liberating surface. Each section is different from most of the others in heat-absorbing surface. Generally the more heat-absorbing surface per section, the less water content there is per section, an unfortunate condition. Even if the sections were identical, each has a different temperature from the others, depending on its location within the boiler. Conceive all these different little boilers trying to get along in the same confederation. There is a different level and consistency for the water in each section, a turmoil at the small openings where communication is provided through the nipples, and we must fire gently if we would avoid a rupture.

5. DRAFT RESISTANCE.

No one pretends to know all there is to know about heat transmission, but it is well-known that the rate of transmission increases with the difference in temperature between the heater and the heatee, or in this case, the difference between the hot gases on one side and the water on the other. There is a decided tendency for the gases, when they become cooler by having touched the heating surfaces, to slow down or stay there, forming an insulating blanket against the hotter gases farther away, just as there is a tendency on the heatee side for the water which has become warm by contact with the heating surface to slow down and form an insulating blanket against the cooler water farther away.

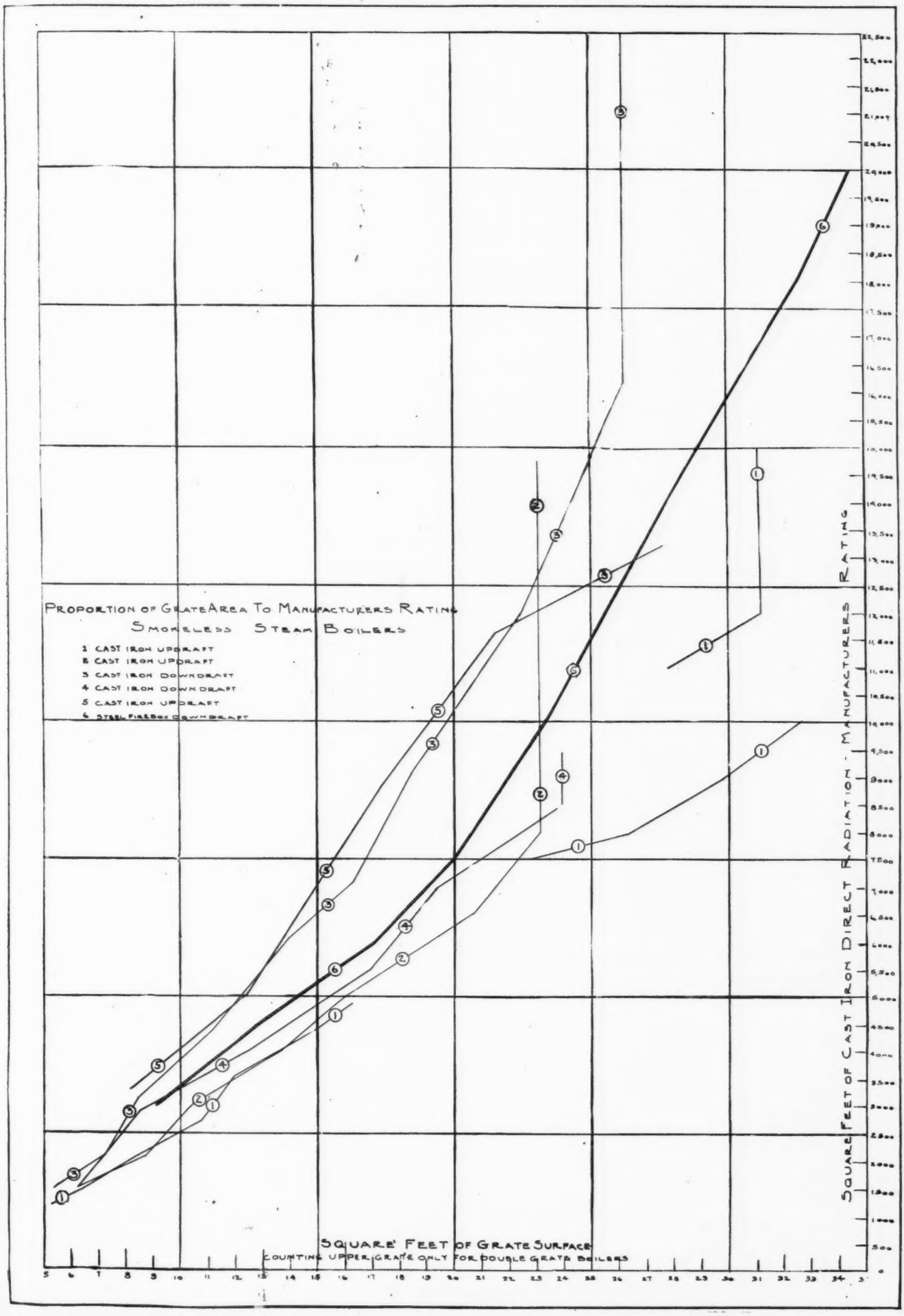
So marked is this tendency of heater and heatee to cling to the heating surface that wonderfully increased transmission rates are obtained when we wipe away the insulating blanket by some mechanical intervention, or when we shape the heating surface so that a part of the insulating blanket must be knocked off by the passing currents.

An example of the first effect may be seen in swimming pool heating. A direct heating coil submerged in the water doesn't do much heating, but if we take some paddles and force the cooler water to displace the heated water close to the radiation, we get a very rapid transmission.

The heating surface of a fan system has been proved vastly less effective when smooth than when covered with studs or projections which break up the air currents and force the constant renewal of the blanket against the hot surfaces. Mechanically moving the air over the heater in this case increases the capacity of the heater about 300%.

Steel boilers, as a rule, have effective arrangements for spraying the products of combustion out to a large number of small tubes, bringing them back to a large chamber, smashing them up against baffles which remix them; spraying them out again to more tubes.

Cast-iron boilers, as a rule, have very much less of this sort of thing, depending more on direct absorption of heat from the fire. Some years ago the tendency of


PROPORTION OF GRATE AREA TO MANUFACTURERS RATING
SMOKELESS STEAM BOILERS
1 CAST IRON UPDRAFT
2 CAST IRON UPDRAFT
3 CAST IRON DOWNDRAFT
4 CAST IRON DOWNDRAFT
5 CAST IRON UPDRAFT
6 STEEL FIREBOX DOWNDRAFT
SQUARE FEET OF GRATE SURFACE
COUNTING UPPER GRATE ONLY FOR DOUBLE GRATE BOILERS
SQUARE FEET OF CAST IRON DIRECT RADIATION - MANUFACTURERS RATING

COMPARISON OF PUBLISHED RATINGS OF SEVERAL LARGE CAST-IRON BOILERS WITH SIMILAR DATA FOR A STEEL FIREBOX BOILER.

cast-iron boilers toward well-broken-up gas passages received a check when a progressive manufacturer discovered how much greater efficiency he could get by increasing the firebox height. Of course he could not increase this height unless he made a higher boiler or cut out secondary heating surface, and he didn't want to make a higher boiler, so he cut out a lot of heating surface. I should say that the tendency at present, while retaining the higher firebox, is gradually to restore the heating surface, and herein lies the hope for greater efficiency for cast-iron construction.

6. FIREBOX CAPACITY.

I remember many years ago being called in on a very large old residence which had a steam heating plant with an old-fashioned cast-iron boiler. It was about 7 ft. long and 3 ft. wide, and it had all the heating surface the pattern maker could devise, so that from grate to firebox top there was only about 15 in. clearance. The owners had trouble to keep the grate covered due to the low clearance, even with the excellent anthracite of that day, and thought they wanted a new boiler. I experimented, with the permission of the owners, and lowered the grates some 24 in., building a firebrick furnace chamber under the old heating surface. After the change there was room for a clean, sharp fire, room for removal of clinkers, room for the gases to mix a little. As reconstructed, the boiler is still in service, satisfactorily.

The steel boilers nearly all always did have big high fireboxes in which you could store a reserve of fuel if you wished, but which, when you wanted quick action at an overload, would give a chance for reasonably good combustion at high efficiency. In power boiler practice the approved height from grates to boiler goes on increasing. A few years ago it was around 5 ft.—now a clearance of 11 to 12 ft. is not uncommon.

7. CONFIDENCE.

The steel boiler makers have nearly always published the pertinent data as to their output. They tell the heating surface and give freely such dimensions as are necessary to allow one to check reasonably the data.

The cast-iron boiler makers have not published the pertinent data. It is extremely difficult for anyone to learn how much heating surface, or steam-liberating area or water content any cast-iron boiler has.

I attach a plotting of the published ratings of a few large cast-iron boilers as compared with the same data for firebox steel boilers. The steel boilers are rated according to heating surface, but this is closely proportional to grate surface. I can't find out what heating surface the cast-iron boilers plotted have.

Anyone can make a chart like this, as it embodies merely grate area and published rating.

DIFFERENCE IN CALCULATING GRATE AREA.

The steel down-draft boiler people call the grate area that of the upper grate, a proper and easily understood procedure. Some of the cast-iron down-draft boilers have an obscure computation which includes part of the area of the lower grates, a procedure easily misunderstood and certainly not competitive.

These boilers plotted are rivals in the field, and ignorant people may think they are competitive. Anyone who compares Curve 1, representing one of the strongest firms in the field, with Curve 2, another prominent boiler, should wake up.

No. 1 is conservative, as far as grate area and rating are concerned. If anything, it may have too much grate, and evidently is designed for long firing intervals.

No. 2, when 23 sq. ft. of grate area were reached, had achieved as much as its peculiar pattern limitations permitted, and so we see its slant become a vertical, with the same grate area for a rating of 8,000 sq. ft. as for 14,750 sq. ft. The explanation is that the rate of combustion must increase from (at an efficiency of 60%) 10.9 lbs. per square foot of grate per hour at 8,000 sq. ft. rating, to 20 lbs. per square foot of grate per hour at 14,750 sq. ft. rating.

No. 3 does the same trick, beginning at a 16,200 sq. ft. rating, with 22.1 lbs. of coal per square foot of grate and terminating at 22,500 sq. ft. rating with 30.7 lbs. of coal per square foot of the same grate.

The steel boiler of 20,000 sq. ft. rating is expected to burn only 18.0 lbs. of coal per square foot of grate per hour.

THE WEAK SPOT IN THE CAST-IRON BOILER RATINGS.

Note that we have two well-advertised cast-iron boilers, presumably for the same service, one of which claims that with 23 sq. ft. of grate we ought to feed not to exceed 7,500 sq. ft. of radiation, burning 10.2 lbs. of coal per square foot of grate per hour, while the other claims that with 23 sq. ft. of grate we ought to feed 14,750 sq. ft. of radiation, burning 20.0 lbs. of coal per square foot of grate per hour.

We find that these two boilers are about the same size and height and must each have nearly the same amount of heating surface and water content.

Something wonderful must exist in boiler No. 2, but if it works so well at a 20-lb. rate, why bother with a 10-lb. rate? Why not use a much smaller boiler in that zone?

Bear in mind, please, that this chart shows grate area and rating only. We do not know anything about the heating surfaces for the cast-iron boilers.

When one contemplates these lines wandering around over the chart, one understands why the trade associations have been compelled to discount so heavily the manufacturers' ratings for cast-iron boilers, recommending the addition of from 50% to 100% to the actual load before choosing, by manufacturers' rating, the boiler.

The fan manufacturers used to rate fans this way, but some years ago found it profitable to publish actual dimensions and rational capacities. I have not heard that they have regretted this step. Why should not such a rule apply equally to cast-iron boilers?

I would emphasize the fact that it is not a competition of cast-iron against steel. Either metal can be made into an excellent boiler. It is a competition of conservatism and uniformity, based on rational principles, fairly shown by Line 6 on the chart, against the chaotic conditions shown by the other lines.

Aerology for Amateurs and Others

The Evolution of Modern Ventilation and its Effect on Present and Future Practice

By E. Vernon Hill

IV—Test Methods

IN the preceding article, we referred to the dry-bulb temperature as a measure of the sensible heat in the air and outlined methods and certain precautions to be observed in making temperature determinations.

It should be emphasized at this point that the dry-bulb temperature is a measure of the sensible heat only, that it does not take into account the latent heat in the air. The wet-bulb temperature, however, is a measure of the total heat in the air, both sensible and latent. The dew-point temperature is always a true indication of the amount of moisture the air contains, irrespective of the dry-bulb or wet-bulb temperature.

THE WET-BULB TEMPERATURE

The wet-bulb temperature, or evaporation temperature, as it is designated by Carrier, is the lowest temperature a surface film of water can assume when evaporating freely into the air. It is always lower than the dry-bulb temperature of the air unless the air is saturated when the dry and wet-bulb temperatures are the same. (The depression of the wet-bulb, viz., the difference between the dry-bulb and wet-bulb temperatures, depends entirely upon the moisture content at the dry-bulb temperature designated.)

The greatest value of the wet-bulb temperature in psychrometric work depends upon the fact that it is a measure of the total amount of heat in the air, both sensible and latent.

Quoting Carrier's fourth psychrometric law: "The true wet-bulb temperature of the air depends entirely upon the total of the sensible and latent heat in the air and is independent of their relative proportions. In other words, the wet-bulb temperature of the air is constant, providing the total heat of the air is constant."

This last sentence is of great importance. It can, perhaps, be made clear to the average reader by the following statements:

The total heat in a given quantity of air is heat made up of two portions. First, the heat in the air itself, considered as a perfect gas. This is the heat we speak of as "sensible" heat and directly affects the ordinary, or dry-bulb, thermometer. The second portion of the heat contained in the air is the so-called "latent" heat. That is the heat required to change the moisture in the air from a liquid to a vapor. With these facts in mind, it is evident that if we increase the sensible heat, we must decrease the latent heat, in order that the total amount remain constant. We can, therefore, increase the dry-bulb temperature if we reduce the relative humidity in a correct proportion and maintain the total amount of heat constant, or vice versa, we can reduce the dry-bulb temperature and increase the relative humidity, maintaining the total amount of heat constant. Furthermore, if we wish to maintain the total heat at a constant point, we cannot increase the dry-bulb temperature unless we decrease the relative humidity, or we cannot decrease the dry-bulb temperature without increasing the relative humidity. Thus it is apparent that any change in the dry-bulb must be followed by a reverse change in the relative humidity if the total heat, that is, the wet-bulb is to remain constant.

This is only another way of stating Carrier's fourth psychrometric principle. It also follows as a corollary of this principle that no change in the total quantity of heat can occur without a corresponding change in the wet-bulb temperature.

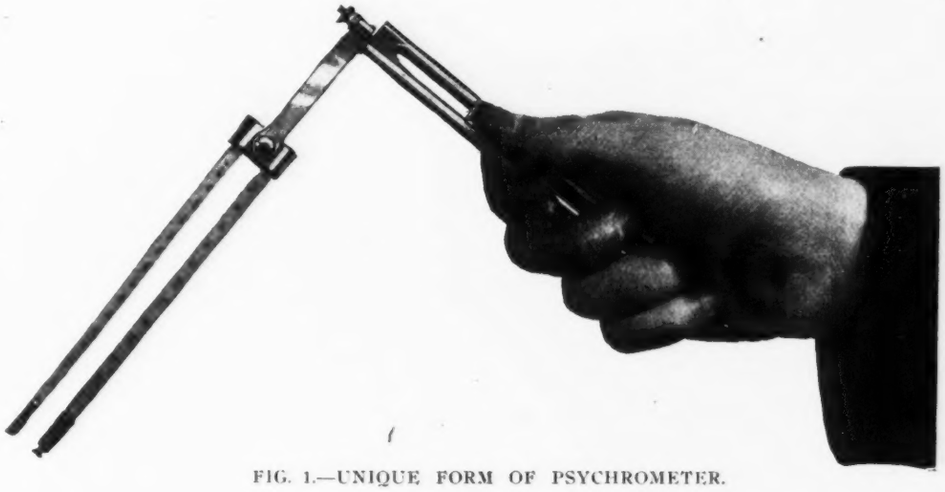


FIG. 1.—UNIQUE FORM OF PSYCHROMETER.

THE WET-BULB THERMOMETER

The wet-bulb temperature is usually determined by mercury thermometers, the bulb of which is provided with a cloth covering, preferably of fine linen or silk. The cloth covering the bulb is saturated with clean water, distilled if obtainable, and the instrument whirled, or swung in the air to facilitate evaporation. Evaporation of the water on the bulb covering reduces its tem-

perature and, by contact, the temperature of the mercury bulb to practically the true wet-bulb temperature of the air.

Various forms of pyschrometers are on the market and are all satisfactory when properly used. The author's design, shown in Fig. 9, is a convenient model in that the handle by which the thermometers are whirled serves as a secure carrying case when the instrument is not in use. The extension bar carrying the thermometers also serves to maintain them in a constant plane of rotation, facilitating control and convenience in taking readings.

In using a psychrometer, the covering of the wet-bulb should be carefully and completely saturated and the excess moisture squeezed off. The operator should also observe the bulb of the dry-bulb thermometer to see that no particles of moisture adhere to it, as evaporation of these would give an incorrect dry-bulb reading.

After the bulb is properly saturated, the instrument is swung in the air for about fifteen second intervals and readings of the wet-bulb thermometer taken. This operation should be continued until the mercury in the wet-bulb thermometer reaches the lowest point, when the readings of both thermometers are taken.

It is sometimes necessary to take wet-bulb readings when the temperature of the air is below freezing. In this case, the covering on the wet-bulb should be removed and the bare bulb dipped in water and the water allowed to freeze on the bulb, forming a thin coating of ice.

The instrument is then whirled and the reading taken in the regular manner. Considerable time is required to obtain a reading under these conditions as the depression of the wet-bulb is always slight and considerable care is necessary to make an accurate determination.

The important precaution to be observed in taking psychrometric readings is to be sure that the bulb is still moist when the final reading is taken. It sometimes happens, particularly at low humidities, that the water saturating the bulb covering evaporates very rapidly and a reading may be taken, if the observer is careless, when part of the bulb covering is dry. This often leads to a material error that can easily be avoided.

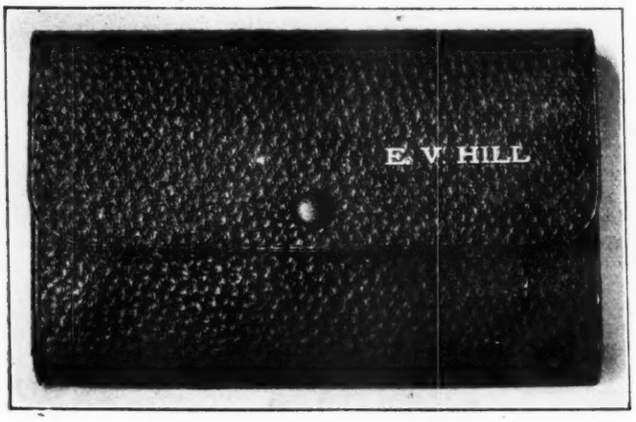


FIG. 10.—THE PSYCHROBOOK.

The Psychrobook (Fig. 10) a modified form of psychrometer, is a convenient device for psychrometric determinations. It consists of a leather pocketbook, containing a 5-in. mercury thermometer in a metal case, a pad of prepared absorbent paper, a psychrometric chart, note paper, etc.

The thermometer is ordinarily used for dry-bulb readings. When it is desired to take a wet-bulb reading, a scrap of the absorbent paper is torn from the book, moistened on the tongue and rolled about the bulb of the thermometer. This makes a simple and convenient wet-bulb instrument. It is shaken in the air practically the same as a psychrometer.

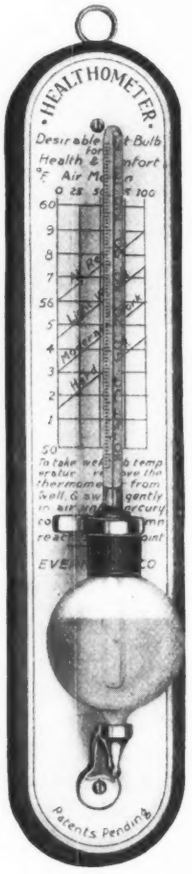


FIG. 11.—THE HEALTHOMETER

After the wet-bulb reading is taken, the absorbent paper covering is removed and discarded. Substituting paper for cloth and discarding the covering after each reading makes it possible to moisten the covering with saliva without fear of error in the reading.

The Healthometer (Fig. 11) is a type of wet-bulb instrument suitable for suspending on the wall and designated to replace the ordinary dry-bulb thermometer which tells only half the story.

The Healthometer is provided with a glass well, or reservoir, in which the bulb of the instrument is immersed. Where the thermometer enters the well, a ground-glass stopper is provided which prevents evaporation and keeps the water content clean. As the water soon takes the temperature of the surrounding air, the instrument ordinarily functions as a dry-bulb thermometer. The wet-bulb, however, can very easily be determined by removing the thermometer from the well and swinging it in the air until evaporation of the water on the bulb gives the proper wet-bulb reading.

A chart is provided on the back of the instrument, giving the correct wet-bulb for various physical states and conditions of air motion.

THE DEW-POINT TEMPERATURE

The dew-point temperature is the temperature to which the air must be lowered to give 100% relative humidity with the amount of moisture present. In other words, if air having a certain amount of moisture is reduced in temperature, a point will eventually be reached when the air has all the moisture it can hold at that temperature and further reduction causes precipitation.

This is the explanation of rain storms. The air is partly saturated with moisture. A cold wind, perhaps reduces the temperature below the dew-point and precipitation occurs.

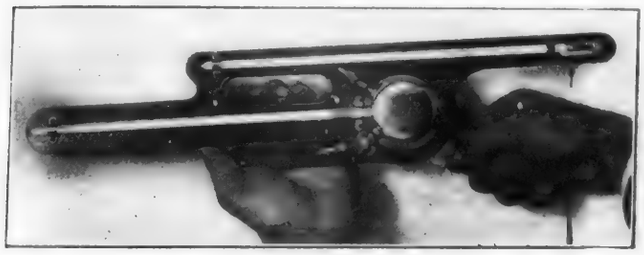


FIG. 12.—PORTABLE INSTRUMENT FOR MAKING DEW-POINT DETERMINATIONS.

The practical limit to indoor humidification in cold weather is determined largely by the condensation of moisture on the windows, due to the cold air out-of-doors reducing the temperature of the glass below the dew-point.

The dew-point temperature may readily be determined by cooling some suitable substance, such as polished metal, or glass, until precipitation occurs on the same.

The classical methods of Daniels or Regnault depend upon this principle.

A convenient portable instrument for dew-point determinations is shown in Fig 12. It consists of two thermometers mounted on a suitable support of low conductivity. The bulb of the upper thermometer is immersed in a circular metal container having a polished silver face. The container has two connections, one to a hand bulb and the other to an absorption chamber at the back (not shown in the illustration). The container is half filled with ether.

In making dew-point determinations, air is bubbled through the ether by operation of the rubber bulb, the rapid evaporation caused thereby reducing its temperature, which is indicated by the thermometer immersed in the same.

When the dew point is reached, a mist, or fog, of condensed moisture quickly forms on the polished surface of the container. The reading of the thermometer should be taken at the point when the first sign of condensation occurs.

A dry-bulb thermometer is also provided with the instrument for convenience.

Other than the fact that a dew-point instrument gives the dew point directly, it has no advantages over the psychrometer. Furthermore, it is more cumbersome and more expensive.

As previously noted, there are three important temperature determinations in psychrometric work, the dry-bulb temperature, the wet-bulb temperature and the dew-point temperature. With any two of these determined, the third and all other psychrometric data can be obtained by referring to a psychrometric chart, a convenient form of which was illlustrated in HEATING AND VENTILATING MAGAZINE for October, 1920.

HUMIDITY

The humidity of the air is spoken of as either "absolute" or "relative." Absolute humidity is the total amount of moisture in a given volume of air at a given temperature and relative humidity as the ratio of the amount of moisture present at a certain temperature to the total amount that could be present if the air was saturated. Relative humidity is a popular term and much has been written concerning it during the past few years.

Attention has been focused on the subject, particularly in school ventilation and we have been told by medical authorities that the air in some classrooms during the winter months is drier than the air over the desert of Sahara. Many of the common ills of school children, enlarged tonsils, adenoids, respiratory ailments, ear and eye troubles, etc., are attributed, in part, at least, by medical authorities to the dry school room air. I do not know of any clinical or experimental evidence that justifies this belief.

Morbidity statistics do not indicate that the Bedouins of the Sahara or the Sheiks of our great American desert suffered from enlarged tonsils, chronic rhinitis, or the other ailments commonly ascribed to dry air. We must, I believe, look for some other cause for these ailments among school children.

The writer is of the opinion that a large part, at least, of these afflictions are due to dust irritation and bacterial infection and not primarily to dry air. It is perfectly true that the low humidity in the classroom is responsible for an increased amount of dust and bacteria in the air and so the low humidity must eventually bear the blame, but it is well to make the distinction.

The low humidity dries out the walls, floors and furniture, as well as the mud and snow brought in on the shoes of the pupils and their clothing, liberating large amounts of dust, which contaminates the air, thus producing the respiratory and other ailments mentioned.

The low humidity also increases heat loss by evaporation from the body, requiring, therefore, a higher dry-bulb temperature to maintain comfort. This, undoubtedly, occasions the common criticism that the temperature in our school rooms is maintained at too high a point. The dry-bulb temperature is not too high under these conditions as the low humidity makes it necessary to maintain the proper wet-bulb. This we have discussed in a previous article.

There is some reason for believing that a low humidity is irritating to the skin and through the sensory nerve endings in the skin to the central nervous system. This is a question for future experimental work to determine.

What humidity is desirable in cold weather for health and comfort? Naturally, this depends upon the dry-bulb temperature, but, in general, we can say that the highest humidity possible from practical consideration should be maintained. Owing to the frosting of windows, previously referred to, and to other practical difficulties, this will be found to be about 40%, giving

us a dry-bulb of 70° and a wet-bulb of 56°. A higher humidity than 40%, where this is practical, will allow of a considerable lowering of the dry-bulb with some increase in comfort and a certain saving in fuel.

In the silk industries, notably in silk weaving and throwing, a relative humidity of from 75% to 80% is carried. This is comfortable for the workers and materially aids in the manufacturing process.

In the sweating of tobacco, a relative humidity of from 85% to 95% is maintained. The writer recalls a tobacco factory where originally the air in the work rooms was not properly humidified. Fine tobacco dust floating in the air produced a haze that made it difficult to see across the room, which was not more than 60 ft. or 70 ft. wide. After proper humidifying apparatus has been installed, the air, without any other treatment, was cleared so that it appeared as clean as the air in any other industry where dust is not produced. This installation, furthermore, increased the comfort of the employees as the dry-bulb was materially reduced, the wet-bulb not increased, and a considerable air motion maintained.

DETERMINING RELATIVE HUMIDITY

There are no accurate devices for determining the relative humidity directly. The dry-bulb temperature and the wet-bulb are taken by means of a psychrometer and the humidity determined from a psychrometric chart.

AIR MOTION

On a hot summer day, when the humidity is high, a person at rest will be distinctly uncomfortable, but by driving under the same air conditions in an automobile, a speed can be easily attained where the heat losses from the body are increased and perfect comfort secured. The same results are obtained by the use of electric fans in hot weather.

FIG. 13.—AMMONIA CHLORIDE MACHINE FOR DETERMINING AIR MOTION.

Air motion is the third factor in the maintenance of comfort, temperature being the first and relative humidity the second.

It is readily appreciated that air motion is a very important factor in determining comfort out-of-doors, but it is not always recognized as a factor indoors. However, the writer has seen so many instances where the failure to give it due consideration has caused discomfort and dissatisfaction with mechanical ventilating equipment, that it is now always determined as routine test work.

Not only must the air motion from fans, supply registers, etc., be taken into consideration, but in rooms without mechanical means for removing the air currents are sometimes set up by exposed window surfaces, hot chimney flues, etc., that cause objectionable air motion, and if the temperature and humidity are not properly adjusted to the same trouble results.

DETERMINING AIR MOTION

The study of air motion in an occupied room is always profitable to the heating and ventilating engineer. It is usually extremely interesting and occasionally very surprising.

Where the air velocity exceeds approximately 50 ft. per minute, the ordinary anemometer may be employed, but it is usually velocities much lower than this that we are called upon to study. For this purpose, the ammonium chloride machine (Fig. 13) is employed. It consists of two glass bottles with specially-designed ground-glass stoppers. The stoppers also act as stop cocks which, when open, allow air to flow through the bottles when the apparatus is in use and to close them effectively at other times. The neck of each bottle is provided with a nipple on either side, one for connection to the rubber air pump and the other for the mixing nozzles where the two gases from the bottles are brought together to form the ammonium chloride cloud.

In using the instrument, one bottle is filled about one-quarter of its content with concentrated hydrochloric acid and the other with strong ammonium hydroxide. It is also well to place small pieces of pumice stone in each bottle to prevent the contents from slopping about and to facilitate evaporation.

In using the instrument, the stop cocks are turned so that the glass air tube, which extends from the stop cock down into each bottle, connects with the rubber pump of the apparatus. A slight pressure of the bulb causes air to bubble simultaneously through the liquid in each bottle, giving off fumes of hydrochloric acid from one and ammonia from the other. These gases are brought together in the mixing nozzle, causing the formation of ammonium chloride, which escapes from the nozzle as a dense white cloud. It floats for a considerable period of time in the air, where its velocity, direction of travel, etc., can be studied.

In determining the velocity of air motion in the room, the operator liberates puffs of ammonium chloride at various points. A second person, stationed approximately 10 ft. away from the operator, and at right angles to the direction of air travel, notices the behavior of the smoke cloud and measures its velocity, preferably by means of a stop watch. Not only the velocity of air currents but their behavior in the vicinity of radiators, cold walls, windows, etc., can be made with considerable interest and profit.

When the observations are concluded, the stop cocks are turned at right angles to prevent further escape of fumes from the apparatus.

(*To be continued*)

Tests of Radiator Traps

By W. F. Stutz,
of the United States Bureau of Standards

(*Presented at the annual meeting of the American Society of Heating and Ventilating Engineers, Washington, D. C., January, 1923*)

THE traps considered are those used at the outlet of each radiator in the so-called vacuum system of heating in which low-pressure steam is circulated by maintaining a reduced pressure or vacuum in the return piping. The steam is brought to the radiators by one system of piping and the condensation and air carried off by a second system. These traps, or valves, are placed in the return line at the outlet of each radiator, dividing the high-pressure from the low-pressure side of the system, for the purpose of discharging the condensation and air from the radiator and of preventing the escape of steam. They are a distinctive and essential part of a system of this character; the success

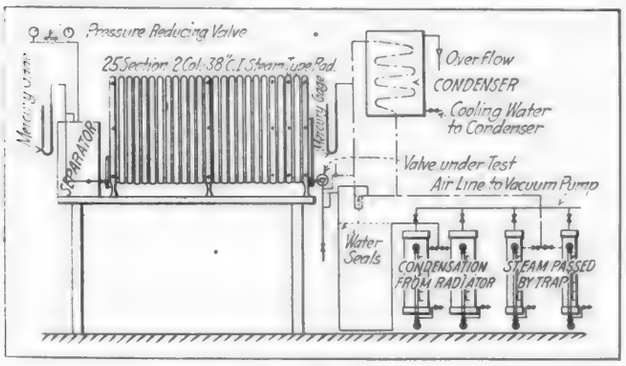


FIG. 1.—ARRANGEMENT OF TEST APPARATUS.

of the system as a whole is principally dependent on the successful performance of the traps.

The ideal operating performance for a trap for this purpose may be defined as follows:

1. It should keep the whole radiator at the temperature of steam supplied, by the continuous removal of condensation and air. The presence of water in the radiator is, also, in itself objectionable since any appreciable accumulation is likely to give rise to noisy operation.

2. It should prevent the wasting of any uncondensed steam to the return line.

3. It should be capable of quickly disposing of the relatively large amounts of condensation and air present when steam is first turned into the cold radiator.

4. It should without adjustment be capable of automatically adapting itself to the changes in operating conditions, relative to steam pressure and return line vacuum, which are likely to occur in practice.

The performance of the valve to meet the requirements listed can be determined by laboratory tests. There has, however, been no method developed for making an accelerated life test which satisfactorily reproduces actual service conditions.

For the purpose of determining how closely traps in commercial production approximate the ideal performance defined, a series of tests was recently made at the Bureau of Standards of eight of the best known and most widely advertised traps, each represented by three identical stock samples.

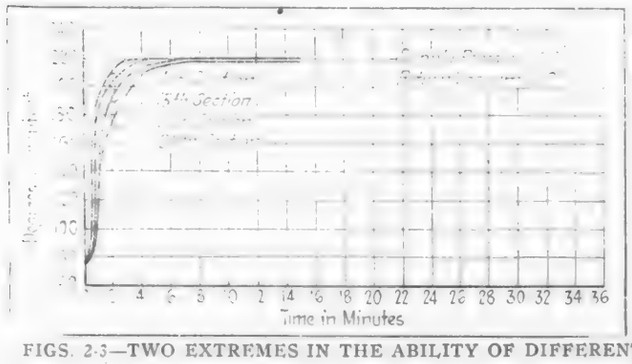
Three operating tests under different conditions were made of each sample, as per the following Table 1:

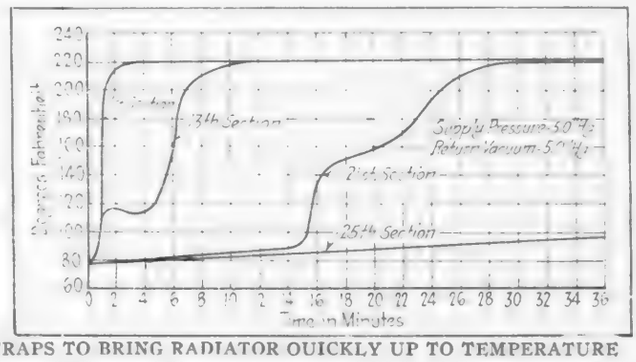
TABLE 1. CONDITIONS OF TEST

Test No.	Supply Pressure	Return Line Vacuum	Duration Hours
	Inches of Mercury		
1	6	10	3
2	6	0	3
3	1	5	6

A further test was made in which steam was turned into the cold radiator and observations made of the time required for various sections of the radiator to reach the temperature of the steam supplied.

A diagram of the testing apparatus is shown in Fig. 1 which is largely self-explanatory. The radiator was of the steam type of 25 2-column, 38-in. sections. The outlet section was of the drop-hub type fitted with an eccentric bushing. The condensation discharged by the valve was collected in either one of the two larger





FIGS. 2-3—TWO EXTREMES IN THE ABILITY OF DIFFERENT TRAPS TO BRING RADIATOR QUICKLY UP TO TEMPERATURE

tanks. The vapor in the piping on the return side of the trap was condensed and collected in either one of the two smaller tanks. The tanks were installed in duplicate so that one could be cut out and emptied, while the second was in use, without interrupting the test. The gauges on the tank were graduated in pounds and fractions of a pound. The vapor pipe connections from the valve outlet to the condenser was made as short as possible (about 18 in. of ¾-in. pipe) and lagged. The riser to the condenser is drained through a water-seal to the collection tanks. A gauge glass on the end section indicated visually the accumulation of water in the radiator.

Observation of the steam pressure, return line vacuum, and the temperatures in the radiator were made at 10-min. intervals. Observations of the rate at which condensation was discharged by the valve and of the rate at which vapor was condensed in the return piping were made at 5-min. intervals. The condensation collected in the vapor tank includes the steam passed by the valve as steam and also the re-evaporation in the return piping resulting from the discharge by the trap of water at a temperature higher than that corresponding to the pressure in the return line. Insofar as the steam wastage obtained has not been corrected for re-evaporation or for the compensating loss of heat from the portion of the vapor piping between the valve outlet and the point where it connects with the riser to the condenser, these results are comparative and are to be referred to the particular apparatus used.

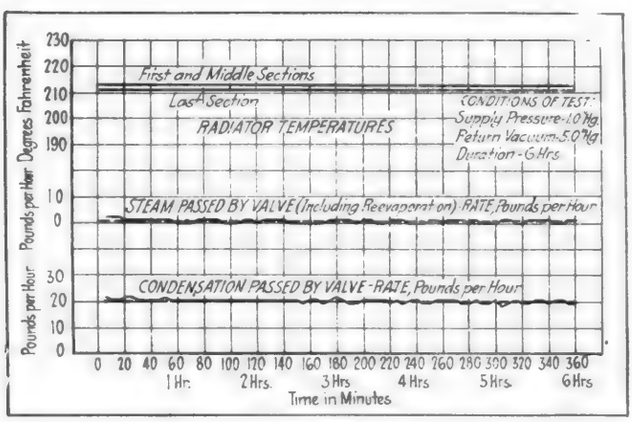

First and Middle Sections
Last Section
RADIATOR TEMPERATURES
CONDITIONS OF TEST:
Supply Pressure-1.0"Hg.
Return Vacuum-5.0"Hg.
Duration-6 Hrs.
STEAM PASSED BY VALVE (Including Reevaporation) RATE, Pounds per Hour
CONDENSATION PASSED BY VALVE-RATE, Pounds per Hour
Pounds per Hour Pounds per Hour Degrees Fahrenheit
Time in Minutes
1 Hr. 2 Hrs. 3 Hrs. 4 Hrs. 5 Hrs. 6 Hrs.

FIG. 4.—A PRACTICALLY PERFECT RADIATOR TRAP PERFORMANCE.

Figs. 4, 5 and 6 show a graphic log of different typical operating performances over a six-hour period. Simultaneous values of the rates at which the valve discharged condensation and passed steam to the return line and of the temperature in different sections of the radiator are plotted one above the other to a common time scale. Fig. 4 illustrates a performance which is practically perfect. The condensation was passed by the trap at a uniform rate, continuously as formed; the whole radiator was kept practically at the temperature of the entering steam; steam wastage was negligible.

Fig. 5 shows the performance of a valve which discharges the condensation continuously as formed, keeps the radiator up to the temperature of the entering steam but continuously wastes an excessive amount of steam to the return line. In Fig. 6 the opposite extreme of performance is illustrated. The trap wasted no steam to the return line but failed to keep the radiator cleared of condensation and air. The lower curve shows the trap passed only a fraction of the normal condensation (about 20 lbs. per hour) for the first two hours, than at a gradually increasing rate for the next two hours until the normal rate was reached and again at a decreasing rate to the end of the test. The radiator was not cleared of water during the test period of six hours. The radiator temperature curves illustrated show the resulting drop in temperature.

A tabulation of the average results for each of the three performance tests of three identical stock samples of the eight commercial traps investigated showed the following:

1. Three traps showed an excellent performance which would meet a most exacting performance specification. All parts of the radiator were maintained at a temperature with 2° or 3° of that of the entering steam; the condensation was discharged at a practically constant rate as formed; and the net steam wastage was well within a tolerance of 3% of the steam condensed.

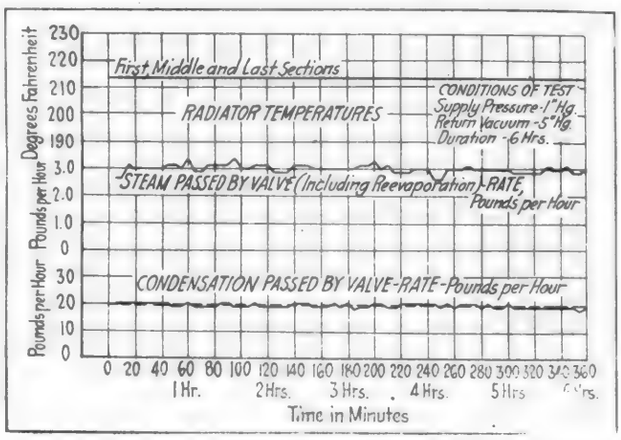

First, Middle and Last Sections
RADIATOR TEMPERATURES
CONDITIONS OF TEST
Supply Pressure-1"Hg.
Return Vacuum-5"Hg.
Duration-6 Hrs.
STEAM PASSED BY VALVE (Including Reevaporation) RATE, Pounds per Hour
CONDENSATION PASSED BY VALVE-RATE-Pounds per Hour
Pounds per Hour Pounds per Hour Degrees Fahrenheit
Time in Minutes
1 Hr. 2 Hrs. 3 Hrs. 4 Hrs. 5 Hrs.

FIG. 5.—TEST SHOWING WASTE OF STEAM THROUGH TRAP TO RETURN.

2. Two traps approximated the above performance but showed a comparatively large steam wastage; one trap showed a consistent excessive steam wastage and two consistently held back water in the radiator to a very marked degree, resulting in a decided temperature drop in the radiator.

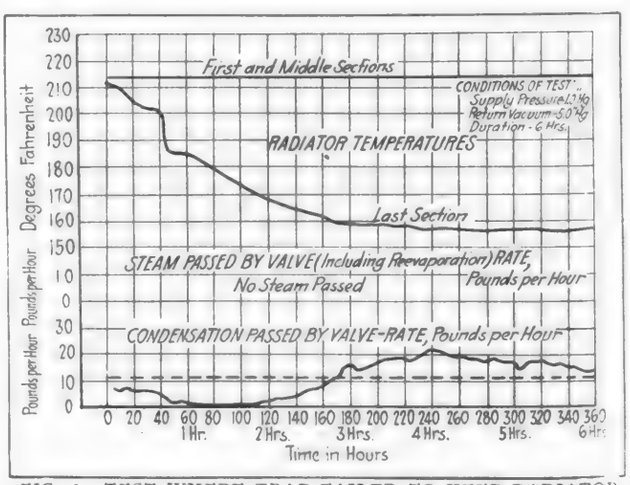

First and Middle Sections
CONDITIONS OF TEST:
Supply Pressure-1.0"Hg.
Return Vacuum-5.0"Hg.
Duration-6 Hrs.
RADIATOR TEMPERATURES
Last Section
STEAM PASSED BY VALVE (Including Reevaporation) RATE, Pounds per Hour
No Steam Passed
CONDENSATION PASSED BY VALVE-RATE, Pounds per Hour
Pounds per Hour Pounds per Hour Degrees Fahrenheit
Time in Hours
1 Hr. 2 Hrs. 3 Hrs. 4 Hrs. 5 Hrs. 6 Hrs.

FIG. 6.—TEST WHERE TRAP FAILED TO KEEP RADIATOR CLEAR OF CONDENSATION AND AIR.

River Coal for Heating School Buildings

Equipment and Methods of Handling Which Offer Suggestions for the Use of Coal Yard Screenings and Small Anthracite

By E. T. Selig

Of the Engineering Firm of Selig and Wilson,
Harrisburg, Pa.

THE high coal prices and fuel scarcity of the present school year have caused no worries to the Harrisburg (Pa.) School District officials, because of their timely adoption of river coal for fuel in the school buildings.

River coal, as it is known around Harrisburg, is very small-sized anthracite that washes down the river from the mining districts, a hundred or more miles away. Some of it comes from the washeries at the mines and some from the old culm piles established as waste dumps many years ago. While there is a great deal of slate found mixed with the coal when taken out near the mines, by the time it reaches Harrisburg, it is practically free of slate, bone, etc., due to the heavier matter settling down as the lighter coal is carried on down stream.

River coal forms bars in the river, much like sandbars; in fact, mixed sand and coal bars are frequently found.

There are many coal fleets operating on the Susquehanna River near Harrisburg. These fleets consist of pumpers, pushers and flats. A pumper is a flat boat on which is mounted a steam boiler, a steam engine, a centrifugal pump and a screen. The engine-driven pump sucks the coal and sand, together with a large amount of water, from the river bed, and discharges the mixture onto the screen. This screen separates the sand from the coal, the coal discharging to the flat alongside, while the water and sand run back into the river. Fig. 1 shows a pumper at work.

The pushers are flat-bottomed, stern-wheel, steam-engine driven boats, which push the loaded or empty flats between the pumpers and the coal docks. Some

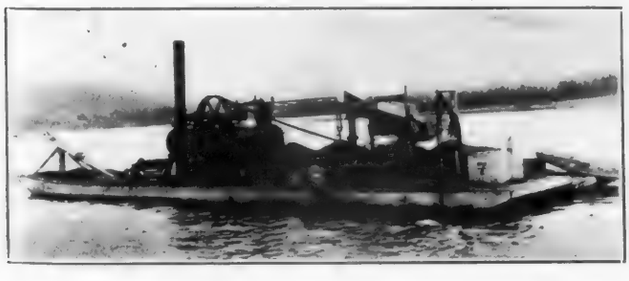


FIG. 1. PUMPER AT WORK RECOVERING RIVER COAL.

pushers use gasoline engine power. A pusher is shown in Fig. 2.

The flats are flat-bottomed, square and scows, each having a capacity of fifteen gross tons of river coal.

RIVER COAL LONG USED IN POWER PLANTS

River coal has, for some years, been used in the large power plants of Harrisburg, more than 100,000 tons being taken out each year. On those pumpers which have improved type of screens the coal is so thoroughly washed free from sand and dirt that it is practically pure anthracite, and a very clean fuel to handle. To burn river coal requires special furnace equipment, embodying special grates, blowers and control apparatus.

Previous to 1921, the Harrisburg school heating plants burned anthracite pea or anthracite broken lump coal, with some bituminous coal used in three buildings. Early in 1921, arrangements were made with a firm of engineers to design the special equipment necessary to permit using river coal, to supervise the installation of the equipment and to supervise the operation of the heating plants for a period of years.

This undertaking has proven remarkably successful and economical. Due to the perfect draft control, better

FIG. 2. PUSHER CONNECTED TO RIVER COAL "FLAT."

heating of the buildings has been possible than formerly.

The economies, due to smaller quantity of coal required and lower price of river coal, have been so great that it has been possible to pay for all the equipment, including the compensation of the engineers, out of the fuel budget without increasing the budget over the amount of the last year before installing river coal. After the present school year, the fuel budget can be greatly lessened, as the equipment cost of the eighteen schools will have been paid for.

HEATING PLANTS ALTERED IN EIGHTEEN SCHOOL BUILDINGS

The heating plants altered in eighteen school buildings consisted of many types of cast-iron steam boilers, water-tube boilers, hot-water boilers and warm-air heaters. For equipping plants with such a large variety of boilers and heaters, it was necessary for the engineers to design and construct a large amount of special equipment, also select and install electric motor-driven blowers, which would furnish the required volume of air at the desired pressure, and, at the same time, possess quietness of operation that would not disturb teachers and pupils located in rooms immediately above the equipment.

Fig. 3 shows two batteries of warm-air heaters, each consisting of four units. The blowers and air ducts are shown installed in front of the heaters. Fig. 4 shows a general view of the equipment as applied to a water-tube boiler in one of the smaller buildings.

The installations were all completed by the time heating was required in the early fall. Coal was purchased subject to the inspection and approval of the engineers, and delivered to each building in quantities sufficient for an entire year. This coal was purchased and delivered at approximately 20% of the cost of anthracite pea coal, which had been previously used, and experience so far has indicated that the tonnage of river coal required is 17% less than the tonnage of anthracite pea coal for the same amount of heating. It has also been shown, by performance, that a long ton of river coal is equivalent to a net ton of bituminous. There is practically no coal lost with the ashes. Fewer ashes have to be hauled away from the buildings since changing to the river coal.

FORCED DRAFT AN ADVANTAGE IN SECURING BETTER FIRE CONTROL

Another advantage in the use of river coal, and one which appeals to the janitors is that due to the use of forced draft. As the draft is always under perfect control, it can be brought up instantly, irrespective of weather conditions. The coal will bank and hold fire for 48 hours, or more, after which, the fire can be brought up to a very active condition in a very few minutes after the blast is turned on. Formerly, during extremely cold weather, it was necessary for the janitors to start the fires as early as 3 or 4 o'clock in the morning; now they can start them two or three hours later, and still have the buildings up to the required temperature before time for the opening of school.

The draft equipment is made automatic by altering

FIG. 3. WARM-AIR HEATERS BURNING RIVER COAL UNDER FORCED DRAFT.

the damper regulator to function by controlling the inlet of forced draft to the ash-pit, instead of controlling the outlet of gases in the smoke pipe, as was previously done when natural draft was employed. Much greater capacity was obtained from the furnaces and boilers so equipped. In a number of buildings, where more than two units were installed, it was found that less units were required to do the heating; thereby allowing one heater or furnace to be held in reserve to meet emergencies.

HEATING PLANTS NOW EQUIPPED TO BURN ANY SMALL SIZE COAL

While the changes in the plants of the Harrisburg Schools have been made primarily with the idea of adapting them to the use of river coal, these furnaces, without any further change, can be used for burning rice, barley or buckwheat coal, as delivered by the mines, or coal yard screenings. There are other advantages in the use of river coal, in that it can be purchased direct from the dredgment, without passing through the hands of brokers, dealers, etc. It is delivered clean, can be handled without breaking up and can be stored in bunkers to any depth without deterioration and without

FIG. 4. WATER-TUBE BOILERS AND FORCED DRAFT EQUIPMENT FOR BURNING RIVER COAL.

danger of spontaneous combustion. It is customary in Harrisburg to store enough coal in the bunkers in the early spring for a full year's supply. This makes the coal supply for the Harrisburg schools independent of agreements between operators, brokers and dealers, coal strikes, freight congestion, etc. At this time, when schools all over the country, and other users of coal, have been facing a shut down or interruption due to coal shortage, the schools of Harrisburg are enjoying an abundance of heat at a small fraction of the previous cost and with no anxiety in regard to supply.

The equipment for converting the boilers and furnaces of the Harrisburg schools was designed, and installed, and is being operated under the supervision of Selig & Wilson, engineers, Harrisburg, Pa.

Multi-vane blowers, direct-driven by squirrel cage 40° ball-bearing motors, were selected for furnishing forced draft. Special grates were supplied by a local foundry after designs of the engineers in charge. Electric power is supplied for all the installations by the local lighting company.

For Standardization of Technical Symbols and Abbreviations

Plans for the standardization of technical and scientific abbreviations and symbols, suggested at a recent conference in New York City, held under the auspices of the American Engineering Standards Committee, are being pushed by a committee organized at that time. Sentiment among engineers, scientists, government officials, business paper editors and industrial executives, as revealed at that conference, was shown to be emphatically in favor of such unification.

Because of the international character of much engineering and scientific work, and the importance of reference books and periodicals in foreign languages, the co-operation of foreign standardizing bodies is being sought.

The present situation with respect to the use of abbreviations and symbols in engineering, scientific and other technical fields is described as comparable to a language which has degenerated into a multiplicity of dialects, each of which must be translated for the users of the others. Unification, it is believed, would result in inestimable mental economies.

Abbreviations and symbols constitute an ever growing and important part in the language of technical men, and the use of one symbol or abbreviation for several terms and that of several symbols or abbreviations for one meaning, are at present, causing a great deal of confusion, misunderstanding, and, often serious errors.

While the recent conference was called at the request of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, and the Association of Edison Illuminating Companies, a brief discussion disclosed the desirability of including as a part of the project the graphical symbols used in engineering drawings, diagrams and the like, for representing instruments and apparatus and components of them.

Friction Head Formulas for Water Pipes

In the article on "Formulas for Calculating Friction Heads in Water Pipes," by Professor F. E. Giesecke, which appeared in THE HEATING AND VENTILATING MAGAZINE for March, the reader will note that Figs. 2 and 3 are transposed. While the curves are almost identical, the full lines for Muffen pipes and the dotted lines for Siede pipes, shown as a comparison of Professor Giesecke's formula (11) with Professor Weisbach's, are in reality a comparison of Dr. Brabbee's formulas (9 and 10) with Professor Weisbach's (6).

The William Cox formula (13) which was given as

$$h = \left(\frac{4v^2 + 5v - 2}{1200} \quad \frac{L}{D} \right) \quad \ldots . \ (13)$$

should be

$$h = \left(\frac{4v^2 + 5v - 2}{1200} \right) \frac{L}{D} \quad \ldots . (13)$$

For Wider Recognition of the Engineering Profession

Greater publicity for the engineering profession through closer contact with the public, constant use by engineers of their Institute titles, and education of the public to a better appreciation of the debt owed the profession, is advocated in a report submitted by C. P. Edwards, A. M. E. I. C. chairman of the publicity committee of the Engineering Institute of Canada.

Among the definite recommendations of the committee are the following:

That articles on the engineer's place in industrial and material progress, based on engineering works accomplished, feature the importance of the engineer.

That members be encouraged to make use of their Institute title on every possible occasion, and that they insist that the title appear after their names in all published articles and in letters to the press.

The committee offered also several suggestions to be carried out by the branches locally, including recommendations that:

A committee in every branch be named to make certain that the local press is supplied with a report of meetings and who shall provide the press with a popular abstract of all papers read, and a summary of addresses.

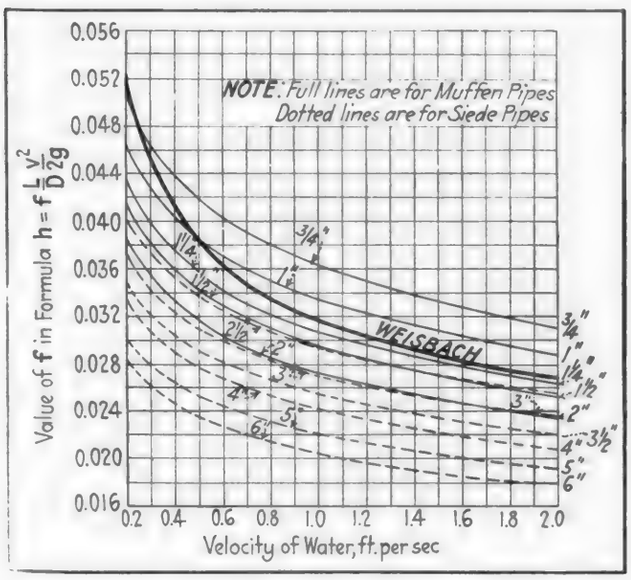
Meetings to which the public is invited, be arranged.

Adoption of a definite object to become a leading influence in the progress of the municipality where located.

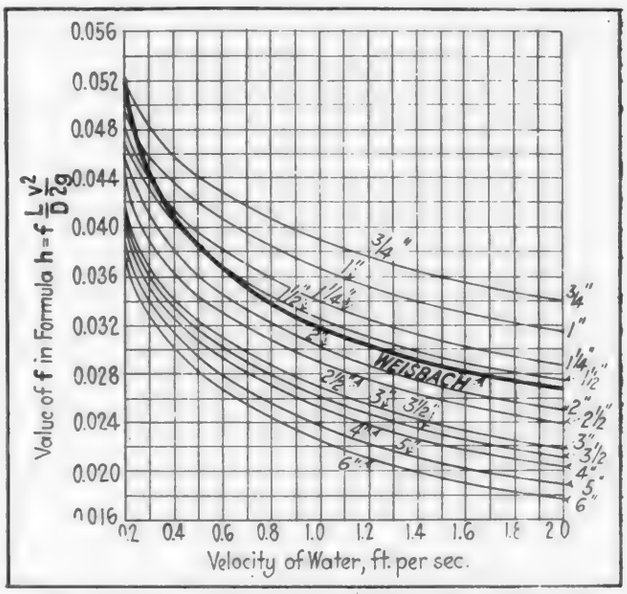
Engineers take an active, constructive part in helping to solve the problems of the community.

Encourage and assist members of the profession to accept and secure offices in the public bodies of the community.

Speakers be provided, as opportunity offers, for local organizations, such as Rotary and Kiwanis clubs, to discuss engineering subjects, emphasizing the practical side of the profession, and urging the necessity of employment of only recognized engineers.



A COMPARISON OF DR. BRABBEE'S FORMULAS (9 AND 10) WITH PROFESSOR WEISBACH'S (6).



A COMPARISON OF PROFESSOR GIESECKE'S FORMULA (11) WITH PROFESSOR WEISBACH'S (6).

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HOW important a part the automobile is taking in the advance of the ventilating industry has been shown in recent months by the extensive plans for the use of blowers in vehicular tunnel work, notably in the vehicular tunnel now being constructed under the Hudson River. Careful estimates of the amounts of carbon monoxide in the automobile exhaust gases have shown the vital importance of maintaining positive ventilation in such enclosures. Indeed, so deadly are these gases that we are now told the automobile is coming to be a menace to the man on the street, at least in the traffic-congested areas of our larger cities. No less important a body than the public health committee of the New York Academy of Medicine is authority for the statement that it is time to take up this problem and determine upon remedial measures.

"The increasing concentration of motor traffic in New York City," states the committee, "has resulted in contamination of the air with carbon monoxide in certain sections of the city which has reached the point where it is regarded as deleterious to health. Carbon monoxide constitutes from 7% to 12% of this exhaust gas, depending on the admixtures to the gasoline. It oxidizes very slowly, if at all, and the rate of rapidity of its diffusion in the streets varies with atmospheric conditions and the velocity of the winds."

The committee calls attention to the studies of J. S. Haldane in London which have led to the formulation of a safety standard in the London underground railways of not more than one part of carbon monoxide in 10,000 parts of air, while the standard adopted for the New York-New Jersey vehicular tunnel is a maximum of four parts of carbon monoxide per 10,000 parts of air, provided no one is exposed for more than thirty or forty minutes.

While the exact data gathered by the committee have not yet been published, and the situation is not, it is admitted, a critical one, it is nevertheless, considered to be serious and warranting a continuation of the investigation.

WINTER construction in the building industry, so far as it has been tried during the past winter, has been carried on with such success that its continuation is being strongly advocated by such bodies as the Associated General Contractors. After noting the fact that, with an average construction program in the latitude of Louisville and St. Louis, the present active season is approximately six months, a report of the association's committee on methods urges its extension to at least eight months.

Seasonal idleness, it is pointed out, always costs money in accumulated overhead charges, inefficient labor and increased plant rental, much of which would be avoided by spreading construction operations through the entire year. Many industrial plants, it is argued, know well in advance that certain extensions are imminent, many public utilities know of improvements surely to be made and many lot owners know that they will soon erect homes. These various parties should be urged to make an early selection of their designer, so that he will have ample time to make complete plans after careful consideration. In addition, an extension of winter construction, it is shown, will enable the professions to keep their regular forces intact and thus insure the best service to their clients.

The committee holds that the effect of climate on modern construction is not the real cause or proper reason for delaying work. Neither lumber, steel nor brick are affected by temperature and it is only the mortar and men's fingers which need artificial warmth in cold climates.

Seasonal unemployment is listed as undoubtedly one of the greatest drawbacks in the field of construction labor. If it is conceded, for example, that $1500 per year is required to maintain an average family, and that 200 working days per year is a fair average of employment, a skilled workman would have to receive $5.00 a day for 300 days, or $7.00 a day for 200 days, a direct increase of 50%. A man could earn much more per year, therefore, at any fair increase over the $5.00 rate than he could at the same increase over the $7.00 rate.

Of equal importance with the wage rate is the maintenance of the industry of ample labor supply of sufficient skill and desirability. As the committee states, a contractor's organization is his best asset, and an movement to lenghthen the construction season will directly reflect itself in his ability to maintain continuous employment of his capable and loyal men. The apprentice is also concerned in the continuous employment question and as we need to encourage young men to enter this field we must make it attractive.

Points on Saving with Vacuum Steam Heating

Apropos of the discussion in THE HEATING AND VENTILATING MAGAZINE for February, 1923, of the question, "Is There any Saving in Vacuum Steam Heating?" the discussion of this point at the last annual convention of the National District Heating Association, as reported in the Proceedings presents an interesting angle from the viewpoint of the central station heating engineer.

The discussion arose from a statement made in one of the committee reports that "vacuum pumps and radiator traps should be in such condition that a good vacuum can be easily maintained without the use of cold water."

"That sentence," commented J. C. Hobbs, "might be subject to two interpretations. Personally, I believe the lower the vacuum that is actually maintained in the system, the lower will be the steam consumption. We have made some rather thorough tests during the past year and in one case we found that it was not necessary to operate the vacuum pumps at all, except in extremely cold weather, and then the vacuum was maintained at less than 1 in.

"An analysis of the vacuum system shows that at high vacuums a considerable quantity of steam is pulled through radiator valves because of dirt on the seats, defective valves, and other reasons; and that heat is thus being drawn away from the point where it should be utilized, into a return system where it is usually wasted by having injection water sprayed into the return line so as to maintain a high vacuum. This not only wastes heat, but it requires water which must also be paid for; then both the water and the condensed steam are wasted by discharging to the sewer.

"The above represents the operating conditions of most vacuum systems. If a vacuum system is necessary, and it is in a few cases due to piping complications, then the vacuum should be carried as low as possible, and the heat, which is drawn back into the return line, should be reclaimed by transferring it through an economizer or closed type of heater to the hot-water system for use in washrooms. Savings of as much as 20% in steam bills have been effected by the use of the latter system.

"The main advantage, I believe, in installing a closed type of cooler on a vacuum system is that this cooler acts as a kind of catch-all or a safety heat collector in case the system is not operated properly and the vacuum valves are allowed to become leaky. If the vacuum valves let steam leak through into the return, then that heat is picked up by the cooling coil installed between the vacuum pump and the heating system, and that heat is saved and is not thrown away.

"I recall one case in a large office building," said Mr. Barbour, "an 18-story building, where they have two large reciprocating vacuum pumps, and they pulled 14 in. of vacuum at the pump, with from 2 in. to 4 in. of vacuum at the reducing valve. That corresponds to a temperature in the radiators of about 205° which is somewhere near the temperature of a water heating job, or at least a vapor job. The condensation per square foot of radiation would be less there. There are a large number of doctors' offices which require a considerable amount of hot water. They maintain a hot water temperature of 180°. If any traps happen to be working improperly it is taken up in the water heating and they certainly do not have to use any jet condensers in the return lines. The traps are all gone over very carefully and are supposed to be in first-class operating condition. You might pull some vapor through the returns that would be warmer than when operating under pressure, but the radiators would be cooler than they would be otherwise."

A comment on this experience, expressed by Mr. Kasten, was that "if he gets 14 in. of vacuum with two or three vacuum pumps, I think he is getting quite a large steam wastage. The vacuum traps are not holding, and considerable steam is being pulled into the return lines and wasted."

In an actual test reported by Mr. Seiter it was found that by varying the pressure from 6 lbs. to a vacuum of about 12 in., there was a difference in steam consumption of about 30%. These tests were made on consecutive days and corrected for temperature. They were made over such short periods because it was felt that the operation would be as similar as possible having consecutive days, rather than if they were taken for a month at a time, and then a month at another time. The return temperatures were around 120°, which, it was figured, was little higher than if no vacuum pumps had been installed. If the traps are working properly, concluded Mr. Seiter, he could not see why any more steam should be pulled through with the vacuum pump than without one.

"The 6-lb. pressure mentioned," declared Mr. Hobbs, "explains to me the difference in the efficiency between the pressure and the vacuum system. Six pounds, we believe, is about 5 lbs. or probably 5½ lbs. more than they should use to get efficiency. In a large building, twenty stories high, the maximum pressure required during the coldest weather was less than 1 lb., and at night, although it was a hotel, the pressure could be maintained at a few ounces and give good service.

"Basically, the high vacuum is a more expensive system to operate. The fact that there are hundreds of vacuum valves all over the building means that some of the valves are going to leak, and if you maintain a high differential over all of the valves, some of them are certain to leak, and the cost will be greater than with a smaller vacuum. As to the physical quality of steam, we all know there is a definite relation between temperature and pressure, and if you have a low pressure or a high vacuum, the temperature is going to be very low, and the temperature will be very low with a high vacuum. The heat must be taken out some place, or else the vacuum pump is pumping heat. If an economizer is installed between the vacuum pump and the heating system, it will be about the best arrangement. Where a vacuum system is installed and operated, it will keep leaky vacuum valves and poor operation from causing increased steam bills."

Discussing the point that by operating at a high vacuum, there is a bigger differential at the radiator trap, Mr. Calvert advanced the opinion that operating with 12-in. or 14-in. of vacuum at the pump and from 2-in. to 4-in. at the reducing valve, there will not be a very big differential at the radiator trap, certainly not as much as you would have if you had pressure in the radiator and atmosphere in the return line.

In reply to this Mr. Hobbs made the point that a 14-in. vacuum is equivalent to almost 7 lbs. per square inch negative pressure. With a 2-in. vacuum the differential is only 1 lb. Certainly, he concluded, 6 lbs. pressure is greater than can possibly be obtained between 1-in. of vacuum (which is equivalent to one-half pound) and zero.

H. R. Wetherell, who is now technical secretary of the association, also took part in the discussion. After expressing his agreement with Mr. Hobbs, he said: "Had that system been operated on 3 or 4 oz., there would have probably been a saving the other way. Looking at the theoretical side entirely, which has worked out in practice in many cases, there are several points which affect the economical operation of a heating system. One of the main practical points to consider is that if you are discharging your condensation into the sewer at the lowest possible temperature, you are thereby utilizing all the heat units you possibly can.

There is practically no difference in pushing or pulling with a high vacuum or a high pressure. It is a case of pull or push. If you can control the temperature in each room and thereby avoid the waste of heat, you can get the benefit of the graduated valve."

Fellows as the Governing Group of an Association.

A recent action taken by the American Public Health Association in establishing a new controlling group to be known as "fellows" calls attention to a development that is likely to be followed by some of the other national organizations. The action, it is stated, was the culmination of a feeling that the welfare of the public health profession demanded the direction of the association by a highly representative group of tried professional health workers. Only professional health workers of at least two years' standing as members of the association and of established professional standing are eligible for election as fellows. Members are defined as persons in active service of public health. They are not to hold office, but may serve on committees, except as chairman.

One of the results of this action, it is hoped, will be to establish in the public mind that "Fellow A. P. H. A." implies recognition of professional standing.

Legal Decisions

Increase of Heating Rates Notwithstanding Contract—Heating Company a Public Service Company Though It Does Not Occupy Streets.

A heating company in Erie, Pa., which had made a 10-year contract in February, 1915, to supply steam to a building at specified rates, subsequently September, 1920, filed at tariff with the Pennsylvania Public Service Commission containing increased rates for steam heat. On the refusal of the company to accept payments on the basis of the contract rates prevailing before such filing, the consumer, the owners of a large office building, complained to the commission that the heating company was not a public utility having the right to file rate schedules.

The company was organized in 1912, but did not begin actual operations until March 1915, as up to that time it had got no one to take its service. The heating company also furnishes steam heat to three other large manufacturing and business concerns and charges therefor under the filed tariff. The company does not occupy any public streets in the city. All of its consumers are in the same block as its plant. The company has obtained an ordinance to occupy certain streets, but has never sought the approval thereof by the Commission.

The Commission (Mayer v. Central Heating Co., Pa. P. S. C. Rep.) holds that under these facts the company is functioning as a public service company. The fact that it does not have its facilities in the public street is not controlling. The company's failure to secure from the commission a certificate of public convenience before undertaking to furnish service to the consumer, is of slight, if any, consequence in a rate case. The company being a public service company, the only rates which it can charge are such as are contained in tariffs filed and published according to the provisions of the Public Service Company Law. Whether these tariffs were unjust and unreasonable or discrimination was for the future consideration of the commission and the case was continued for hearing on the question.

Discontinuance Authorized of Competing Water Heating Service.

The Illinois Commerce Commission granted the application of the Bloomington & Normal Railway & Light Company for permission to discontinue its water heating service in Bloomington, notwithstanding the existence of a franchise, it being shown that reasonable compensation could not be had from the operation of the plant, and the company owned a competing steam heating service, which served a much larger proportion of consumers. The most serious objection to changing over from hot water to steam service arose from the necessity imposed on owners of property of making substantial changes in their interior piping arrangements, the expense varying from thirty to seventy cents per square foot of radiation installed. The commission thought that, as the change was simply a question of time, the present was as advantageous a time to make it as in the future.

The commission found that the maintenance of competing water and steam heating plants in the central part of the city of Bloomington has involved a duplication of investment and has caused and will continue to cause higher costs of operation and higher rates to consumers than could be afforded by a single system, properly conducted and efficiently operated; and that the continued operation of the hot water system within the district covered by steam service was not required, nor was it in the public interest.

Contractor's Bond for Benefit of Persons Holding Liens Under Contract.

Where a building contractor has executed a bond "for the use and benefit of all persons who may become entitled to liens under the said contract," an action may be instituted on the bond by a heating contractor to recover a balance claimed to be due him for furnishing and installing the heating equipment for the building, as provided in the contract. The action is based on the building contractor's bond, and not on his contract, although the plaintiff cannot recover by introducing the bond alone, but must show that he performed the labor and furnished the material for which he is entitled to the lien. If the contract has been lost a copy of it, or of the essential parts of it, may be introduced.—Willis v. Knauth, Indiana Appellate Court, 137 N. E. 557.

Contractor Need Not Prove Performance to Owner's Satisfaction, Though Required by Contract

The New York Appellate Division holds, Caro v. Newmark, 197 N. Y. Supp. 426, that, where a contract involves no question of fancy or taste, but merely that the last installment is to be paid "after completion of the entire job to the satisfaction of the owners," the contractor is not bound to show that the owners were actually satisfied, but need only prove full performance of the work.

Contractor Allowed to Recover Notwithstanding Breach, With Deduction for Part Not Performed.

The New York Appellate Division holds, Coopersmith v. Wang, 203 N. Y. App. Div. 290, 197 N. Y. Supp. 419, that although a contractor for an installation in a building has substantially breached his contract, a verdict for the amount due on the contract price does substantial justice between the parties if it is corrected so as to reduce the amount by the sum which the owners were obliged to pay for the performance of work which the contractor failed to perform.

Chamber of Commerce's Report on Trade Associations.

After a year of investigation, a special committee of the Chamber of Commerce of the United States has submitted its report on the activities of trade associations, and the report has been made the basis of a referendum to members of the Chamber.

The propositions on which members are asked to vote "yes" or "no" follow:

"Because of numerous useful and important functions of obvious propriety trade associations should exist for each important branch of industry and commerce.

"A trade association should have such a membership that it can be representative of the industry in connection with problems affecting the general advance of the industry.

"A trade association should be prepared to consider all problems affecting the general advance of its industry or branch of commerce.

"Trade associations should continue free from special forms of government control.

"Statistics of capacity, production, stocks, and sales should be collected by a trade association for its industry or branch of commerce.

"Statistics of actual prices in closed transactions should be collected by a trade association for its industry or branch of commerce.

"Any interpretation of statistics or other comment which could induce or facilitate concerted action on the part of members should be omitted by a trade association.

"Statistics of capacity production, stocks, sales, and prices a trade association should make as available to the public and to government agencies interested in following the course of industry and commerce as to members."

Functions which trade associations perform in the interest of members and the community at large, the committee pointed out in its report, are illustrated by the standardizing and safeguarding of the quality of goods; reducing the waste in manufacture and distribution; promotion of trade; and the upbuilding in scores of ways of industry and commerce.

The committee's survey revealed the existence in most trade associations of a department of statistics which seeks to gather by reports from members the "quantities on hand, quantities in process, quantities sold, distribution and prices, and quantities in unfilled orders."

"That the courts and investigations made by the Secretary of Commerce have disclosed a small minority of associations which may have misused statistics in carrying out a scheme to restrain trade" the committee reported "we believe in no way invalidates or discredits legitimate collection and distribution of trade statistics by associations."

Testing Heating Systems in Other Than Zero Weather

Why the use of "equivalent temperatures" is not a satisfactory method of testing a heating system when the outside temperature is other than that for which the system was originally designed or specified, is brought out in a striking report of a committee on this subject, submitted at the recent annual meeting of the American Society of Heating and Ventilating Engineers. The idea of using "equivalent temperatures" in this connection was first proposed to the society in 1910 by William Kent and has been used from time to time by engineers when testing direct steam heating systems.

In its report the committee submits the following reasons why it is impracticable to apply the "equivalent temperature" method:

The following assumptions are of necessity made when this method of testing is applied and formulae for equivalent temperatures are assumed to satisfactorily apply. These formulae will be found on Page 317, Trans. Vol. 26:

a. The heat emission of direct radiation is directly proportional to the difference between the steam temperature inside the radiator and the average air temperature surrounding the radiator.

b. The heat transmission of the enclosure walls, ceilings and floors of the building is directly proportional to the difference between the inside and outside air temperatures.

c. The weight of air entering by infiltration in unit time is a constant regardless of the temperature difference and wind velocity.

Assumption *a* and *b* are perhaps sufficiently accurate, although not scientifically correct to warrant adoption.

Assumption *c* however is not warranted and is likely to lead to serious error if used.

Applying the usual formulae and conceding *a*, *b* and *c* are correct and assuming we have run a test on a system designed for 70°—0° conditions, steam temperature 220° and the test is run when the outside temperature is 30° the equivalent inside temperature should be 90.4°.

The load carried by the radiation, $\frac{220-90.4}{220-70}$ boiler, piping, etc., is therefore or 86.4% of the load that would have to be carried by the apparatus when operated under designed conditions, namely 70°—0°.

It is readily apparent that such a test covers only the amount of radiation installed.

The boiler and other parts of the system could be, for the preceding example, approximately 15% smaller capacity than should be installed.

It is a well-known fact from the observation of members of this society that a greater load frequently exists on a heating system when operating at a higher outside temperature than specified as the wind velocity is usually higher.

The following example will make this clear:

The heat loss per hour from a certain room, calculated in the usual manner, for 70°—0° condition—sash not weather-stripped—wind velocity assumed 15 m.p.h., cubical contents room 3520 cu. ft. it is as follows:

Wall 104 sq. ft. x 13	= 1352 B.T.U.
Glass 72 sq. ft. x 79	= 5688 B.T.U.
*Infiltration (59 lin. ft. crack) 1½x0.075x0.24x 70x60 x 59	= 6690 B.T.U.
Total	= 13,730 B.T.U.

*Infiltration 1½ cu. ft. per minute per linear foot crack.

Corresponds to 1½ air changes per hour.

Assuming that the test was run with an outside temperature of 15°, and wind velocity 30 m.p.h., the heat loss would be about as follows:

Wall 104 sq. ft. x 10.2	= 1061 B.T.U.
Glass 72 sq. ft. x 61.9	= 4464 B.T.U.
*Infiltration 0.3x0.075x 0.24x55x60 x 59	= 10,514 B.T.U.
Total	= 16,039 B.T.U.

*Infiltration 3 cu. ft. per minute per linear foot of track.

This indicates that the heat loss and consequently the load on the heating system under the test condition would be approximately 16.039—13,730=3309 B.T.U. or 20% higher than that for which the system was designed.

Owing to practical difficulties of making average air temperature readings and wind velocities in order to apply proper correction factors to the formulae, the committee states that it does not believe it practical and certainly not advisable for the society to recommend a test code for complete heating systems.

The committee recommends a complete code for the design of all standard types of heating systems in place of a test code for systems. Its recommendations were given in the report submitted 1921 and will be found in the January *Journal* of that year. Heating systems, if properly designed and installed, concludes the report, should not require testing as a whole.

Federal Fuel Administration's Suggestion for Soot Removal.

Unable to obtain the usual supplies of anthracite coal this winter, householders and apartment building owners throughout the east have had to turn to the use of soft coal for home heating. One result has been numerous flue fires and an occasional shingle roof blaze.

A simple plan for the removal of soot on heating surfaces is suggested by the Federal Fuel Administration Board, which points out that accumulations of soot reduce the value of the fuel and frequently clog the flues and start fires.

The board's suggestion is:

The fire is put into good condition with a substantial body of hot fuel. Common salt, thoroughly dried, is then thrown or sprinkled onto the incandescent fuel bed in a quantity depending entirely on the size of the furnace. In the case of a house heating furnace, one pound at a time is ample, in the case of a large power plant boiler, four or five scoops full may be required. The dampers are kept open so as to maintain the furnace temperature and the salt is allowed to remain until the fumes have entirely disappeared.

Immediately upon charging the salt, the furnace becomes filled with dense white fumes which may require as much as half an hour to entirely disappear. If results are not secured on the first application, it should be repeated as often as necessary.

Once the heating surface is thoroughly cleaned a small application every few days is usually sufficient to keep it so.

Danger in Carbon Monoxide from Natural Gas

Tests just completed by the Bureau of Mines at its Pittsburgh, Pa., experiment station, following announcement of a number of deaths from carbon monoxide in several cities, are described in Serial 2443 issued by the bureau. As a result of its studies the bureau has issued a public warning that improper combustion of natural gas in heating appliances in common use may release the deadly gas.

The tests were conducted with a standard make of radiant heater, well constructed, and of the usual design sold for burning natural gas. The gas consumption, gas pressure, orifice pressure, size of orifice, and heater adjustments were changed so as to obtain as many different operating conditions as possible.

As is well known carbon monoxide is produced during incomplete combustion of any carbonaceous material, and quantities as low as 0.2% may cause death in a short time. For healthy atmospheric conditions in the home, in which the occupants are continuously exposed, carbon monoxide should not be present in amount greater than 0.01%. Among suggestions offered by the bureau as a result of its investigation is one to manufacturers to stamp on each heater sold, other than yellow-flame heaters, in a conspicuous place where it will not be easily removed, what kind of gas the heater is intended for, as "For Natural Gas Only" or "For Artificial Gas Only." The orifices should be locked and accompanied by instructions not to change without consulting the local gas company.

The bureau made also numerous suggestions to the public to guard against liberation of carbon monoxide. In the matter of flues the suggestions are:

Flues on radiant heaters are always desirable. Heaters operated at excessive gas flows, or used with oversize orifices or poorly constructed, giving low air-fuel ratios at the burner ports, should be attached to flues.

Never sleep in a room in which a flueless heater is burning without having at least one window wide open to supply adequate ventilation. This one precaution would have prevented many deaths the past few months.

Central Station Heating

Showing the Heat Consumer How to Save Money

A policy that is being extensively advocated for central station heating companies of helping the consumer to effect economies in the use of his heating service, was discussed at length at the last annual meeting of the National District Heating Association, the full discussion being now available in the association's Proceedings.

As President Walker said, in starting the discussion, this question has been neglected too long. "I think we are doing the right thing," said Mr. Walker, "in coming to the front and showing the consumer how to save money. We feel that in Detroit we are making a great deal of headway along these lines. In a certain sense it may seem to be wrong to show a man how he can get along with a less amount of your product than he has been buying. However, in the long run it is going to react to the advantage of the utility company to help the consumer to economize, and you will be repaid by the good feeling you have created in the mind of the consumer."

"One of the outstanding features, in big buildings in particular," said J. Earl Seiter, "in trying to show the customer how to reduce his steam consumption, and perhaps the hardest problem to contend with, is the proper instruction of the engineer, so that he will take enough interest in his steam system to keep the consumption at a minimum. Usually they don't care and will use the method of least resistance; they will not worry about the temperatures in the building or whether the windows are open or closed.

"As we have some of the engineers trained now, they realize that if they forget their steam systems for one hour they have practically lost their salary for that day. Many of them are watching the temperatures in various sections of the building and cutting off certain sections, depending upon the wind or sunshine or something similar which will permit this practice, and thus keep the entire building at a comfortable temperature with less consumption. Others watch the general temperature of the building and shut off steam whenever possible, not only at night or some pre-determined time, but as much during the daytime as possible. In the building where the operation is most economical you will find two or three peaks during the day. That is all. The rest of the time the consumption is zero.

"The next thing is to keep the engineer after his equipment. He will perhaps have a building well equipped with thermostatic traps but will not look after them, and consequently all his return lines are hot perhaps twenty-four hours a day, and are radiating heat to parts of the building where it is not necessary.

"To check up the operation of the building we install a demand meter which records the demand every half hour, and by taking these demand meter charts or curves to the building manager or to whoever is in charge and interested in the building we can show him by graphic evidences where he is wasting steam and how it can be saved. By this means we have accomplished in some cases a saving of as much as 70% on some buildings.

"The greatest saving is by getting the customer to shut off at night. One customer got the idea that by throttling the house valve he was saving money. After he received two bills from the company he decided he would have to do something because he could not afford to pay such steam bills. He was instructed to turn off the steam as much as possible and watch his system, which he did. He found he could get along in the coldest weather by having the steam turned on only about four hours, thus saving about 80%.

In another building, a garage, in particular, they were trying to keep the entire bulding up to 70°. It was so constructed with runways from one story to another that the ground floors were contiually cold and the upper floors overheated. They did not know how to remedy it. After one or two trials we found that by heating up the building once a week or so (heating the walls), that it stayed warm enough for the men to work and prevent the cars from getting too cold to start properly."

"In these days of public utilities commissions and various utility investigations," said Mr. Barbour, "it behooves us to see that all of our customers are instructed in proper operation. This may mean a considerable amount of work, with no apparent return in dollars and cents. In Detroit we have about 2200 customers, some large, but a greater number of smaller ones whose radiation may run from 80 to 200 sq. ft. The greatest number of complaints on bills originate from these latter. They can direct public opinion just as well, and in fact do direct it perhaps more forcefully than some of the larger consumers, because the latter have less cause for complaint, as they watch their operation more closely.

"We found in instructing the small consumers and even those up to the size of small office buildings, where the manager of the building had other duties to perform and had no time to give to the operation of the heating system and where the engineer was usually no engineer at all, but a general utility man, that it was hard to impress upon them the proper method of operation.

"We have tried various and sundry methods of getting them to follow our instructions, one of which was to have meter-reading cards printed and have the engineer read the meter once or twice each day.

"I recall one case of a small office building about six stories high. The manager of the building also headed a real estate company and he could not give a great deal of time to the heating problem, and his engineer evidently did not, because he was not satisfied with his bills at all, and it was suggested to him that he install a recording pressure gauge on the steam riser to his office, which was on the top floor of the building. He did that and he had his stenographer change the recording charts regularly. This recording pressure gauge was in use all winter. Consequently he kept his steam consumption down very well by observing the number of hours that steam was on each day. He also installed a recording thermometer on his water heating system, and maintained the water temperature between 120° and 130° all winter. While that is rather low for the average office building, he gets by with it all right and has greatly reduced his consumption for water heating.

"It has been suggested in some buildings that the engineer be paid a bonus. Most building managers are not in favor of this idea, but I know of one case in a large department store where the engineer has been paid a bonus and the consumption dropped nearly 5%."

"In some cases," declared W. H. Whitton, "there is much more than the good will of the customer involved in the question of educating the consumer to the proper utilization of his heating service. I am looking at the matter from the point of view of the electrical supply company. We had a rather costly experience last year. There was a large office building using our service to the extent of about $25,000 to $30,000 a year. They also used the street steam. Their steam bills, although we did not know it at the time—we are not connected with the steam company in any way—were very high, and at the end of the winter season a smart engine salesman got in touch with the owner and before we knew anything about the matter at all, he had them sewed up to a contract for the installation of a generating plant, the cost to be paid out of the savings effected in the combined cost of steam and electricity. He could very easily do that because of the very high steam bills.

"One of you steam men could have gone in there and by your proper methods of procedure, have cut down the steam bills to the same degree, that is, made the same saving that the engine man promised. The result was that the salesman put his isolated plant in there and I feel quite confident that if nothing is done to reduce the use of steam for heating, the next step will be the installation of boilers, and both the electrical company and the steam company will be losers."

Analysis of Exhaust Steam Heating Operation

A simple analysis used very effectively to convince isolated plant advocates that they do not obtain their heating service free when they have a sufficient amount of exhaust steam at all times to supply the heating requirements was one of the interesting things brought out by J. C. Hobbs, at the last annual convention of the National District Heating Association and which has just been published in the Association's Proceedings.

Fig. 1 shows the amount of steam required for the different months of the year. The shaded portion shows the amount of steam which is wasted during the spring, summer and fall months when the exhaust steam available exceeds the heating requirements.

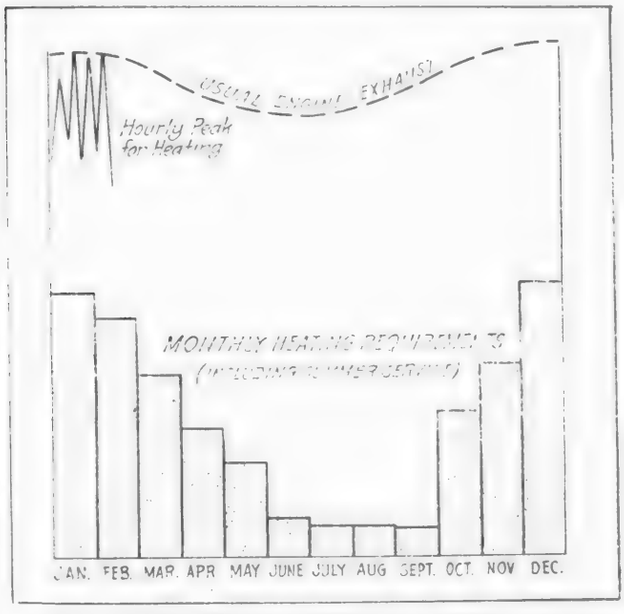

USUAL ENGINE EXHAUST
Hourly Peak for Heating
MONTHLY HEATING REQUIREMENTS
JAN. FEB. MAR. APR MAY JUNE JULY AUG SEPT. OCT. NOV DEC.

FIG. 1—STEAM REQUIREMENTS IN A TYPICAL BUILDING FOR THE DIFFERENT MONTHS OF THE YEAR.

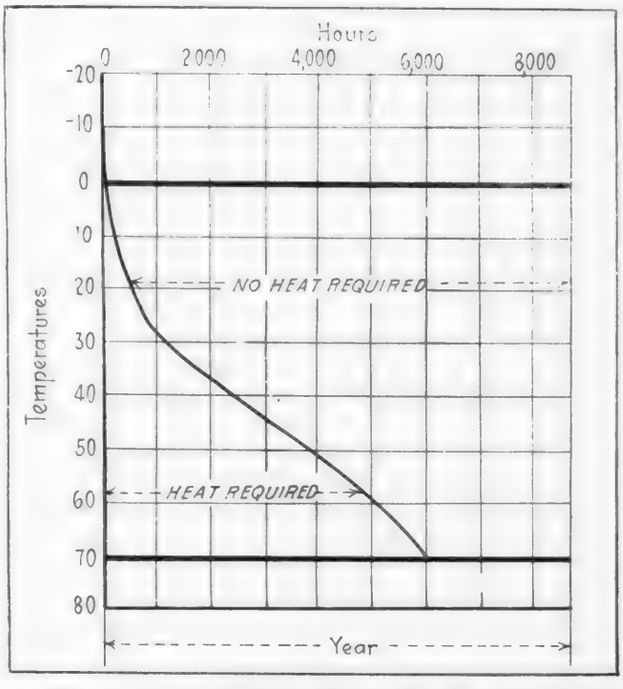


FIG. 2—LOAD DURATION CURVE FOR THE PITTSBURGH DISTRICT, IN DEGREE-HOURS.

Mr. Hobbs also presented an interesting load duration curve for the Pittsburgh district expressed in degree hours; the heating load factor, as will be noted, is approximately 25%. A study brings out the following facts:

1. Heat is required for less than 5000 of the 8760 hours in the year.

2. Ten per cent. of the plant capacity is only required 125 hours, or 1.4% load factor. Twenty-five per cent. of it is used only 600 hours, or 6.9% load factor, while one-half of the plant operates 2100 hours or 24% load factor, out of a possible period of operation of 8760 hours.

In addition, there are the daily and even hourly variations which cause great loss.

Safe Storage of Soft Coal Would Stabilize Industry.

While investigators are agreed that safe storage of bituminous coal is probably the only solution of the problem of stabilizing the coal industry, no such general storage system has been devised. Many methods, such as storing under water or in an atmosphere of carbon dioxide; screening the coal and storing only large sizes; cooling the coal pile by means of ventilating pipes; and covering the coal pile with sand or a layer of fine coal to prevent breathing of the heap, have been suggested, but none has been found adaptable generally. Some do more harm than good and others are prohibitive because of the cost.

Joseph D. Davis, fuel chemist, and John F. Byrne, research fellow, representing the United States Bureau of Mines and the Carnegie Institute of Technology, respectively have just completed a study of the spontaneous combustion of soft coal. They found the loss by deterioration at ordinary temperatures to be small in comparison with that caused by rapid oxidation at elevated temperatures and the loss by spontaneous ignition.

The tendency of coals to fire spontaneously differs with their age—the younger coals being the most dangerous, these investigators report. No case has been recorded in which anthracite coal fired spontaneously, even fines and slack grades storing safely. The liability of different bituminous coals to fire varies widely on account of the differences in the coal, but broadly speaking, it was found the bituminous coals of the eastern part of the United States store better than the coals of the Middle West. These, in turn, were found safer to store than the sub-bituminous coals of the Inter-mountain region.

Solution of the problem of spontaneous combustion may lie, it is pointed out, in the microscopic examination of coals and its correlation with the rate of heating. Coal is composed of three parts, namely, anthrazylon, or bright coal; attritus, or dull coal; and mineral charcoal, and may be separated into almost pure samples of each. These three constituents differ in their ease of oxidation and rate of heating. Tests indicate that the anthraxylon is the constituent that heats first in the spontaneous heating of coal.

As a result of their experiments, Messrs. Davis and Byrne said the presence of fines in a coal pile should be avoided. Coal should be handled as little as possible and should be screened whereever practicable, before storing. Coal coarser than ¼-in. showed no rapid self-heating.

Experiments showed that with the same coal, moist air will give a lower "critical" or spontaneous combustion temperature than dry air. Therefore wetting the coal pile to retard heating is not good practice unless the coal is completely immersed.

Partly oxidized coal seems to act as a deterrent when mixed with fresh coal. Danger in mixing two grades of coal arises from physical rather chemical causes, it was found, although if no heating has occurred at the surface of the heap, it is safe to pile more coal on top, provided there is no accumulation of fines at the contact of the new and old coal.

Artificial mixtures of coal and pyrite in various proportions showed a critical temperature no lower than that of the coal alone, while pure pyrites had a critical temperature 26° C higher than the coal. From this it appears that massive pyrite or "brass lumps" are not dangerous in a coal pile.

Because of the low conductivity of coal, cooling by artificial ventilation is almost impossible unless the air reaches every part of the pile, the investigators report. Generally the air travels through the stack in currents, and exerts no cooling effects on parts a short distance away from its channels. Exclusion of the air as much as possible, in order to stop oxidation, was more successful than attempts at ventilation to dissipate the heat generated.

Use of Term "Square Feet" in Discussing Heating and Power Costs for Buildings.

Further discussion of the article published in THE HEATING AND VENTILATING MAGAZINE for January, 1923, on "Heating and Power Cost Analysis for Office Buildings" brings out the fact that there has been some misinterpretation of the figures given due to the fact that the term "square feet" in the tables refers to the square feet of rentable area in the buildings, and not to the square feet of heating surface in the radiators. Making allowance for this difference the figures will be found to agree very closely with some of the data compiled on the other basis.

Supplementing the figures contained in the article, some additional data has been furnished by Mr. Shultz, vice-president of the Illinois Maintenance Company (the central station heating company of Chicago) based on the square feet of radiation installed in six of the Chicago buildings reporting in the Accounting and Exchange report of the National Association of Building Owners and Managers. This information has been furnished to us through the courtesy of Lewis B. Ermeling, executive secretary of the association:

Bldg. No.	Sq. Ft. of Rentable Area	Sq. Ft. of Radiation	Sq. Ft. of Rentable Area per Sq. Ft. of Radiation	Pounds of Steam per Sq. Ft. of Radiation at 88 lbs. per Sq. Ft. of Rentable Area.
12	690,618	90,000	7.6	675
13	378,942	65,000	5.8	512
15	239,124	40,400	5.9	521
3	570,437	86,000	6.6	583
17	188,494	30,000	6.3	552
19	418,972	75,000	5.6	491

"From the table it will be seen," states Mr. Ermeling, "that the steam consumption per square foot of radiation in Chicago ranges from 500 to 700 lbs. per season."

"In connection with the steam figures issued by the association," adds Mr. Ermeling," I would call attention to the fact that they are the actual figures turned in by our member buildings. If there are any errors in the report, they would be errors of interpretation of the figures, rather than in the actual figures themselves. Also averages of steam consumption in buildings in all parts of the United States are of no real value as applied to any specific locality. As a matter of fact, the actual steam consumption per square foot of radiation per season for the buildings listed above is different from that given in the table. A rate of 88 lbs. of steam per square foot of rentable area is used because the conclusions of one correspondent were based on that rate of steam consumption."

Powdered Coal Combustion Tests.

The results of tests of a large boiler fired with powdered coal, conducted at a plant of the Milwaukee Electric Railway and Light Company by the Bureau of Mines and the Combustion Engineering Corporation, are given in Serial 2438, recently issued by the Bureau of Mines. The object of these tests was to determine the thermal efficiency, ease of operation, and other particulars of a boiler equipped with specially designed furnace and burners for burning powdered coal. The boiler tested has 13380 sq. ft. of heating surface, and is one of eight boilers equipped with the Lopulco powdered coal system supplying steam to two 20,000-Kw. steam turbines in the largest power house burning powdered coal. Twenty-six tests were run at rates of heat transference varying from 4000 to 8000 B. T. U. per square foot of boiler heating surface, and the mean thermal efficiency attained was about 84%, based on the gross calorific value of the fuel as fired. The efficiency varied little with the rate of steaming, and its high value is accounted for by the small loss from incomplete combustion and the small amount of excess air which varied from 5% to 36%.

The coal burned had a gross calorific value of about 11500 to 12800 B. T. U. per pound, containd 2% to 5% moisture, 33% to 36% volatile matter and 9% to 13% ash, and was so ground that 89% to 95% would pass through a 100-mesh sieve. The ash had a softening point of 2150° to 2450° F., but did not fuse together at the bottom of the furnace because it was partly protected from the flame radiation by means of a series of water tubes connected to the boiler which were placed between the furnace bottom and the flame.

1923 Year Book of American Engineering Standards Committee.

Great progress has been made during the last year in standardization projects affecting mechanical engineering and the metal industries, according to the 1923 year book of the American Engineering Standards Committee, which has recently been published. At the end of the year, the report shows, 121 industrial standardization projects were definitely under way or had been completed and the standards approved.

Among the standards which have been approved by the A.E.S.C., the following are of special interest to the ventilating and heating industry: pipe threads; use, care and protection of abrasive wheels; national safety code for the protection of industrial workers in foundries; methods of laboratory sampling and analysis of coke; and safety code for the protection of the heads and eyes of industrial workers.

Two hundred and seventy-five national bodies—technical, industrial and governmental—are cooperating in the work of the A.E.S.C. and more than 900 individuals are serving on sectional committees. These committees carry on the actual standardization work, the A.E.S.C. acting only as an administrative body.

An important accomplishment of the past year, the report points out, was the development of a plan of cooperation between the Federal Specification Board and the A.E.S.C. by which the specifications of the board are submitted informally to the A.E.S.C. before final adoption. This plan makes it possible for the government to receive the criticisms of the industry interested in any particular standard. Dr. A. S. McAllister, who has been serving as a special liason officer of the Bureau of Standards, has been designated by the Federal Specifications Board for a similar position in the cooperative work with the A.E.S.C.

A Discussion of English Heating Practice.

One of the guests at the recent annual meeting of the American Society of Heating and Ventilating Engineers was W. Nelson Haden, a former president of the (British) Institution of Heating and Ventilating Engineers. In response to an invitation from President McColl, Mr. Haden made an interesting address on English heating practice which explained some of the reasons why it differs from that usually followed in this country.

"We in England," said Mr. Haden, "are following your work in the United States very closely. You go ahead perhaps a good bit faster than we do, as the necessity for heating is much greater in this country. Our methods are different because our conditions are different, especially in steam and hot water heating practice. Your tendency is to use special systems, while our practice is to use the system best adapted to the building being heated, choosing either gravity warm, or circulated warm air, gravity hot water, or forced circulation hot water. The difference between the latter two in our practice is that we can use the term accelerated up to about 10 ft. frictional head, then we use the term forced hot water up to 50 ft. head or over.

"Several of the members have asked about the way we lay out hot-water heating and in this connection, I might say that considering the system of forced hot-water circulation in the National Museum discussed the other evening, we should probably have dealt with it as a two-pipe system, and have obtained a more accelerated circulation through the radiators, having the flow main coming down from the roof, decreasing the pipe sizes as it descended connecting into the top of the radiator and picking up the return on the opposite side of the radiator, which would have reduced the size of the vertical mains. We find that we get a higher efficiency from the radiators when we have flow and return connections for accelerated work rather than a single connection as was sketched in the discussion of the paper the other night.

"Another method that we use to avoid unsightly vertical main pipes, etc., is to run horizontal mains, the circulating main being carried round the building and the radiators standing on mains. This is done especially in old buildings with elaborate cornices.

"With reference to temperatures—our average temperature during the seven months of the year when the heating system is needed, is somewhere from 40° to 45° and we heat to about 60°. we

very often run our heating surface at a comparatively low boiler temperature, even 120° or under.

"Accelerated hot water circulation is being used very much more now than it was. When it was first introduced it was used mainly on large systems. It is now used on very much smaller systems than was anticipated some few years ago because of the extra efficiency which we got out of our boilers from the fact of the more rapid circulation over the heating surface. We generally use in what we call the accelerated system, about 10 ft. head and generally about 4 or 5 ft. head for small installations.

"With the mild outside temperatures which we have to deal with, especially in the late spring and early autumn, when perhaps we have a temperature of 50° to 55° outside and want 60° inside, we are able to reduce our boiler temperature, and to work somewhat comparatively with the outside temperature; avoiding the necessity of the continual regulation of radiators, which is necessary when you have a high temperature surface such as you would have with steam even with vacuum systems. We very often get out alternative estimates for the two systems for the benefit of our clients or architects because of the question of cost. Of course the cost of the steam system is less, because there is much less radiation, and that, with the greater differences in temperature over here, would be very much more accentuated than it would with us in England.

"In an installation erected a year or two ago, which was a filing factory during the war covering about 80 acres, taking depreciation and interest on capital into account it was found that on the basis of the first year, steam was the cheapest; on the second, steam was still a little cheaper; on the third year the saving in actual running charges brought the hot-water down to considerably below: and of course every year afterwards there would be an advantage on the cost by the use of hot-water. Generally where we convert a steam system into a water system we get anywhere from about 10% to 35% in saving from the fact that we run at such a low temperature during a good part of the year. Of course our flue gases leave the boiler at a very much lower temperature than is necessary when using steam, as steam temperature must be maintained whatever temperature may be required in the rooms.

"On the installation that I was speaking of, there were about 25 miles of pipe besides the radiators. The longest distance to which circulation was carried was 2,700 ft. from the boiler. The temperature drop was 10° on that distance. We work usually with about a 30° drop between flow and return at the boiler The test taken there enabled us to determine the relation efficiency between hot-water and steam boilers.

"The ability to control the temperature of a hot-water system from the boiler means that we do not find it necessary in most cases to adopt your automatic thermostatic regulation for individual rooms and radiators, because the nearly general temperature being reduced to nearly the temperature required, the economy in putting thermostatic regulators in hardly justified the expense."

How to Figure Greenhouse Heating Equipment.

The accompanying table, which was compiled by Hitchings & Co., Elizabeth, N. J., shows how to get at the amount of 3½-in. cast-iron pipe necessary to heat a greenhouse to the temperature wanted, when the outside temperature is at zero:

TABLE I.

Divide square feet of glass and equivalent by	
For 70° to 75°	1.8
For 65° to 70°	2.28
For 60° to 65°	2.62
For 55° to 60°	3.
For 50° to 55°	3.46
For 45° to 50°	4.
For 40° to 45°	4.67
For 35° to 40°	5.5

TABLE II.

For temperature above zero, multiply figures obtained from ratios (Table I.) by:	
5°	0.915
10°	.84
15°	.75
20°	.66
25°	.585
30°	.5

TABLE III.

For temperature below zero, multiply figures obtained from (Table I.) by	
— 5°	1.06
—10°	1.15
—15°	1.24
—20°	1.33
—25°	1.42
—30°	1.5
—35°	1.58
—40°	1.63

For 2-in. pipe, use the same table and same example, and multiply the amount of 3½-in. pipe obtained by 1.61.

It should be noted that the ratios mentioned are based on an average temperature of 150° F. of the water in the heating pipes.

FIGURING PIPE REQUIRED FOR COILS AND BOILER CAPACITES.

If, for example, it is desired to heat a greenhouse containing 5800 sq. ft. of glass equivalent to a temperature of 55° to 60° F., when the outside temperature is zero.

5800 ÷ 3 =	1933 3½-in. pipe, for coils.
Mains, etc. (approximated) =	193 3½-in. pipe, equivalent
	2126 3½-in.
Pipe, total rad.	
For a surplus of boiler power add	212 3½-in.
Capacity of boiler, pipe	**2338 3½-in.**

Boilers for this class of work are rated as taking care of given numbers of linear feet of 3½-in. cast-iron pipe or 2-in. wrought-iron pipe. In this case a boiler rated at 2350 ft. would have a good working surplus. If, however, soft coal is used, a rating of 2740 ft. should be used. This is due to the fact that soft coal requires a larger grate surface than hard coal, as it cakes and the draft is not as good. Soft coal also makes more boiler surface necessary for the reason that the soot from soft coal is harder to get off than the dust from hard coal, and soot, of course, prevents to some extent the passage of heat to the water. The rule given, where soft coal is used, is to install one size larger boiler.

Heating and Ventilation Exhibit at Atlantic City Exposition.

An exhibit of apparatus for heating, ventilation and fire protection, together with demonstrations of systems used for those purposes, will form an interesting feature of the American Home and City Beautiful exposition to be held in Atlantic City from June 16 to September 8.

Fully cognizant of the importance of heating and ventilation in the construction of homes, the exposition management has arranged exhibits covering all of the essential branches of the trade. It is expected that more than 10,000,000 people will visit the New Jersey resort during the twelve weeks of the exposition.

In addition to the heating and ventilating exhibit there will be eight main groups, featuring leading American industries, including in its sub-divisions the following: building materials and specialties; lighting; decoration; furniture; the garden; and home economics.

The exposition will be held on the Million Dollar Pier.

National Warm Air Heating and Ventilating Association Convention.

The tenth annual convention of the National Warm Air Heating and Ventilating Association will be held at the Hotel Winton in Cleveland, Ohio., Wednesday and Thursday April 18 and 19, 1923. A program covering both the commercial and engineering phases of the industry has been arranged.

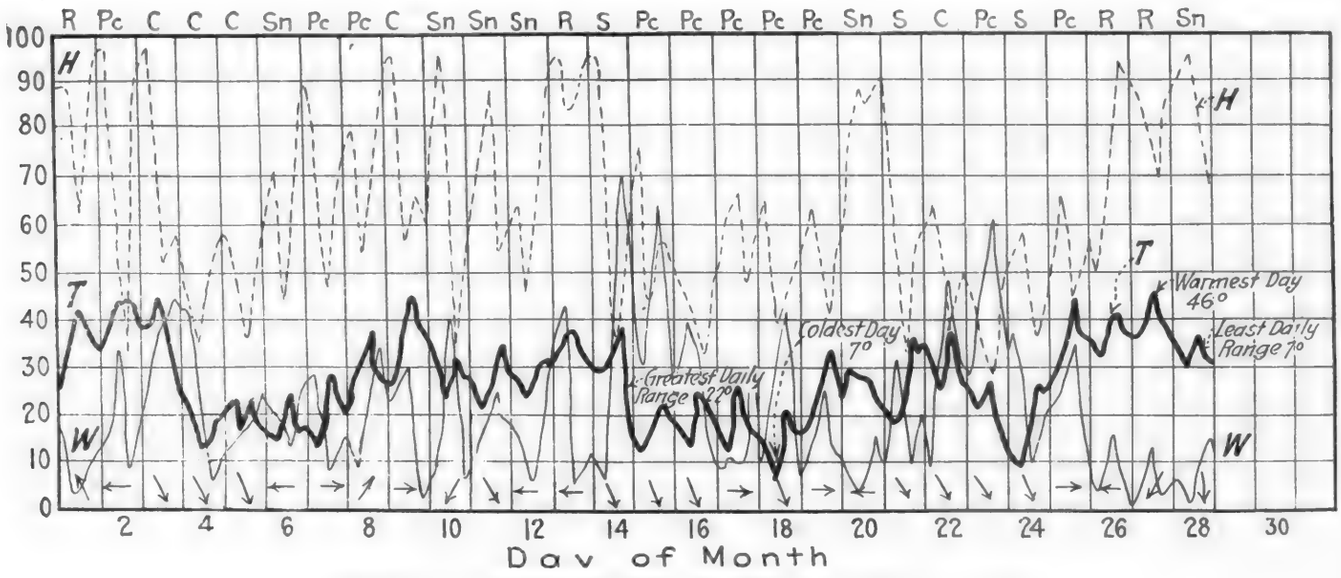
One of the more important discussions scheduled for the convention will be on the subject of the standard warm-air furnace code. Clarence H. Lyman, representing the Joint Committee on Standard Code, will make a report on the first day of the meeting and G. A. Voorhees will read a paper on the "Practical Application of the Standard Code" on the forenoon of the second day.

Other important subjects on the program include: Report of advisory committee on warm-air research, P. J. Dougherty, chairman; report of association research work at University of Illinois A. C. Willard director, and A. P. Kratz and V. S. Day, assistant directors; paper on "Fans as Applied to Warm Air Heating" R. W. Menk; and the "British Thermal Unit" by F. Paul Anderson.

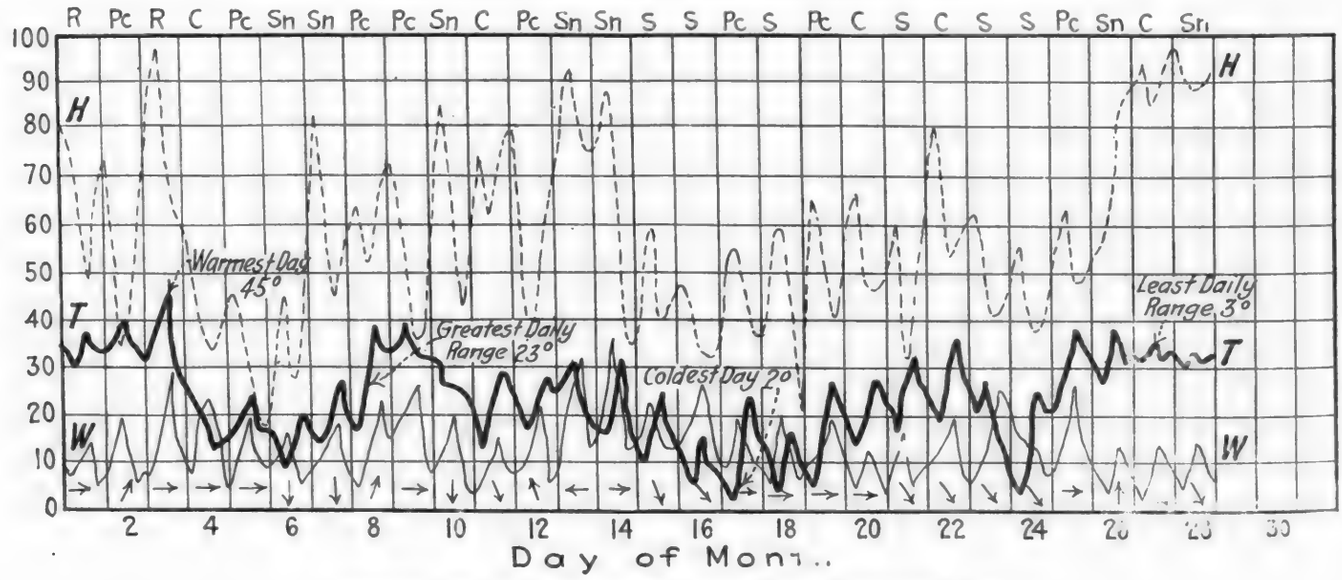
Among entertainment features will be a special and informal dinner on April 18 in the Hotel Winton.

The Weather for February, 1923

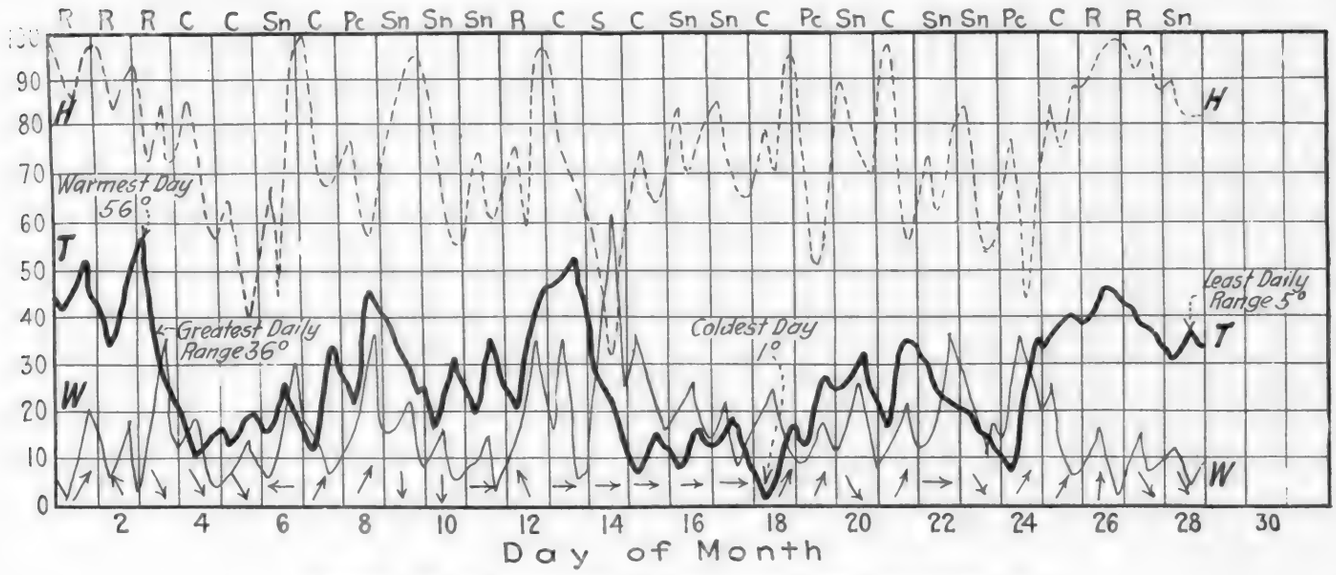
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F.	46	45	56	44	54
Date of highest temperature	27	3	3	26	13
Lowest temperature, degrees F.	7	2	1	—8	1
Date of lowest temperature	18	17	18	4	4
Greatest daily range, degrees F.	22	23	36	28	28
Date of greatest daily range	14	8	3	3	13
Least daily range, degrees F.	7	3	5	5	6
Date of least daily range	28	27	28	7	26
Mean temperature for month, degrees F.	27.1	23.4	27.4	22.3	30.4
Normal mean temp. for month, degrees, F.	31.3	28.8	32.3	27.4	34.5
Total rainfall, inches	2.33	1.48	2.18	1.05	1.50
Total snowfall, inches	17.4	14.4	12.1	8.0	5.1
Normal precipitation, this month, inches	3.74	3.44	2.66	2.16	2.75
Total wind movement, miles	11565	7443	8723	8129	8368
Average hourly wind velocity, miles	17.2	11.1	13.0	12.1	12.5
Prevailing direction of wind	N. W.	W.	N. W.	W.	N. W.
Number of clear days	3	8	1	8	8
Number of partly cloudy days	13	10	6	5	7
Number of cloudy days	12	10	2.1	15	13
Number of days on which rain fell	14	10	15	11	10
Number of days with snow	9	7	10	8	4
Snow on ground at end of month, inches	0.2	5.8	T	T	0


R Pc C C C Sn Pc Pc C Sn Sn Sn R S Pc Pc Pc Pc Pc Sn S C Pc S Pc R R Sn
H
T
W
Warmest Day 46°
Least Daily Range 7°
Coldest Day 7°
Greatest Daily Range 22°
Day of Month

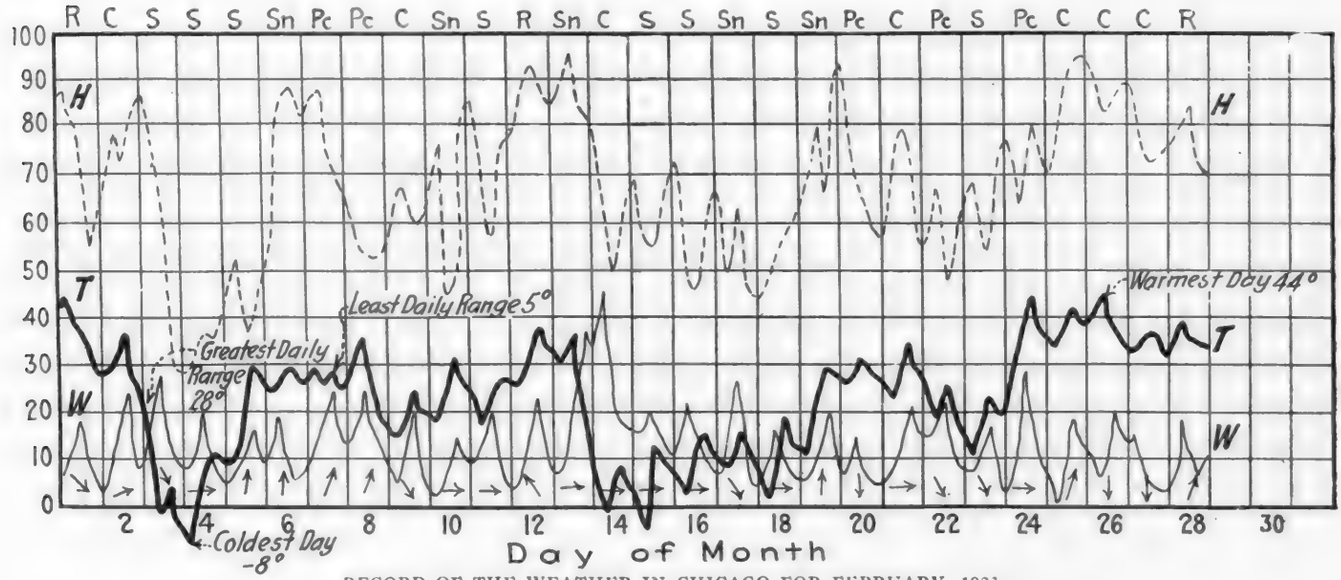
RECORD OF THE WEATHER IN NEW YORK FOR FEBRUARY, 1923.
(Hourly Observations of the Relative Humidity Plotted on this Chart).


R Pc R C Pc Sn Sn Pc Pc Sn C Pc Sn Sn S S Pc S Pc C S C S S Pc Sn C Sn
H
T
W
Warmest Day 45°
Greatest Daily Range 23°
Coldest Day 20°
Least Daily Range 3°
Day of Month

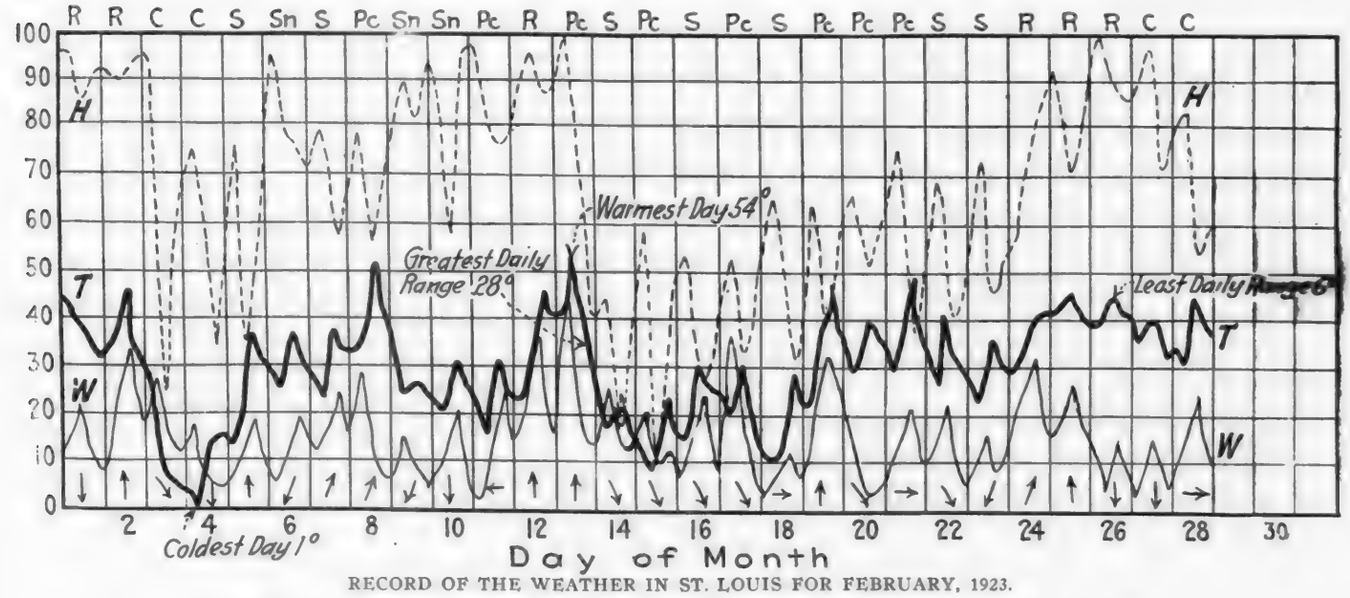
RECORD OF THE WEATHER IN BOSTON FOR FEBRUARY, 1923.


R R R C C Sn C Pc Sn Sn Sn R C S C Sn Sn C Pc Sn C Sn Sn Pc C R R Sn
H
T
W
Warmest Day 56°
Greatest Daily Range 36°
Coldest Day 1°
Least Daily Range 5°
Day of Month

RECORD OF THE WEATHER IN PITTSBURGH FOR FEBRUARY, 1923.


R C S S S Sn Pc Pc C Sn S R Sn C S S Sn S Sn Pc C Pc S Pc C C C R
H
T
W
Least Daily Range 5°
Greatest Daily Range 28°
Warmest Day 44°
Coldest Day -8°
Day of Month

RECORD OF THE WEATHER IN CHICAGO FOR FEBRUARY, 1923.



RECORD OF THE WEATHER IN ST. LOUIS FOR FEBRUARY, 1923.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A. M., 12 M., and 8 P. M.
S—Clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing directions of wind.

Correspondence

The New York State Engineers' License Law.

EDITOR HEATING AND VENTILATING MAGAZINE:

In an editorial in your March issue, you lay stress on the necessity of getting a New York license to do engineering there. As no engineer can know in what state he may be asked to practise, that law won't stand the first test. Besides, it is silly to expect engineers to pay $25.00 in every State for a license to practise there. No court can sustain such a law. The Constitution gives every man protection in his business in the United States. No state can nullify that by local enactments. Nor can New York State cut out engineers who live in that state. The law is silly, narrow, of the trade-union style, unworthy of those who proposed it.

Norristown, Pa. ENGINEER.

In the list of exemptions in the so-called "Engineers' License Law" which becomes operative May 5, next, it is stated that "practice as a professional engineer . . . in this state by any person not a resident in this state and having no established place of business in this state, when such practice does not aggregate more than thirty days in any calendar year, provided that such person is legally qualified for such professional service in his own state or country."

Another noteworthy exemption is made of those "engaging in professional engineering . . . as an employee or pupil of or under the direction of a licensed professional engineer . . . , or as an employee or pupil of or under the direction of a professional engineer . . . provided that such practice may not include responsible charge of design or supervision as principal."

Commenting on the word "responsible" in the foregoing paragraph a statement issued early in March by the American Society of Mechanical Engineers, through its Special Committee on Registration of Mechanical Engineers in New York State, refers to the impression which has prevailed that this law required the licensing of only those engineers who are engaged in independent or consulting professional engineering as individuals and did not apply to a firm of engineers or to engineers who are members of the engineering staff of manufacturers, public utilities and other users of engineering services, who are, in law, responsible to the public generally and their customers particularly for the character of the engineering performed by the technical staff.

"A close study of the law," continues the statement, "brings out the fact that it may be interpreted to apply to everybody in the State doing any kind of engineering work to which the term 'responsible' can be applied, and that any person not registered on or before May 5, who publicly calls himself an engineer, as in stating his occupation when registering as a voter in the State, is liable upon trial and conviction to a fine of $100 or $500, or to imprisonment for three months, or to both fine and imprisonment."

This special committee of the A. S. M. E. proposes that the New York State Legislature be requested to postpone the date of mandatory registration for one year and, to this end, has sent out a questionnaire to the members to secure their views on the matter. In the statement accompanying the questionnaire, arguments are presented in favor of asking for postponment, against asking for postponement, together with arguments for and against licensing in general. The substance of these arguments is given herewith:

ARGUMENTS IN FAVOR OF ASKING FOR POSTPONEMENT.

Mechanical engineers have generally believed that the law applied solely to independent consulting engineers and to engineers engaged by manufacturers to conduct highly specialized scientific and technical work, bringing them into direct contact with the public as authorities on such specialties. It is impossible for these men to be registered by May 5. The law is manifestly drawn with regard rather to the conditions of civil engineering work, that is, with individual responsibility directly to the public, than to the conditions of mechanical engineering work where the responsibility is indirect. Neither the A. S. M. E. as a whole nor any of its local sections has been invited by a legislative committee to submit views on license legislation affecting mechanical engineers.

ARGUMENT AGAINST ASKING FOR POSTPONEMENT.

Ignorance of the law does not excuse an infraction of it and mechanical engineers may, if a request is made for a postponement of the date of mandatory registration, appear to the legislature and to the public as so negligent of their public relations that they do not deserve the relief requested. In order, therefore, not to make public their earlier lack of interest in license legislation it is better to run the risk of indictment for violating the law.

ARGUMENTS FOR AND AGAINST LICENSING IN GENERAL.

Care, it is pointed out, should be taken in forming judgment to differentiate between the principle of licensing and this particular law in the State of New York.

Licensing Engineers to Safeguard Life.—The affirmative arguments are based largely on the danger to life of unsafe bridges, buildings, operations and mechanisms, which hazard, it is claimed, can be greatly reduced if only engineers of proved ability are permitted by a license law to engage in such work. The negative arguments are mainly based on the alleged impossibility of examining and licensing engineers so that only competent men can be employed. The chief arguments against licensing mechanical engineers as a body to diminish such risks as improperly guarded boilers and the like are that the state already has good laws well administered covering them.

Licensing Engineers to Safeguard Health.—It is claimed that unless an engineer has at least a definite minimum amount of engineering knowledge and experience, fixed by a license law, small municipalities, etc., may employ men to design water supply and sewerage works which may endanger health. The opponents of licensing claim that a better way to safeguard health against such dangers is to provide a competent tSate board whose approval of plans for such works must be obtained before they are built. Arguments are rarely, if ever, made that mechanical engineers must be licensed to safeguard health, possibly because the State factory inspection, labor and workmen's compensation laws, and the like, are considered to cover this field reasonably well.

Licensing Engineers to Safeguard Welfare.—There are two distinct aspects of the arguments under this head, one aspect relating to the welfare of the public, the other to the welfare of engineers as a large group.

(*a*) Licensing engineers is claimed by some to be the best way by which the public can be protected against charlatans who will waste the money invested in the works they design and build. The annual waste of money on account of poor engineering, particularly in public works, is asserted to be enormous and capable of substantial reduction by engineering license laws. The general answer made to this argument is that (1) the low minimum degree of knowledge and experience set for a license and (2) the impossibility of determining by any practicable form of examination if an applicant possesses the judgment needed to make his knowledge and experience available for responsible charges of engineering work, combine to render licensing practically valueless for this purpose. The opponents of licensing of mechanical engineers point out, further, that very few mechanical engineers are associated with men, firms and corporations except those having enough business ability and experience to investigate the qualifications of the members of their staffs for their work, and mechanical engineers are therefore in a different relation to "welfare" than are civil engineers, who are largely engaged in work there seems to be more individual responsibility for the task performed.

(*b*) It is frequently claimed that licensing engineers is desirable as giving them an established status in the courts, like lawyers, physicians, nurses, dentists, vet-

...ians and druggists, to name a few of the classes forbidden to follow their callings until licensed or registered in some legalized manner. Such a legalized status will, it is claimed, elevate engineering as a profession in the eyes of the public.

The general answer made to this argument by some opponents of licensing is that if engineers cannot, by themselves, demonstrate to the public by the work they do and their useful activity in public affairs, that engineering is a highly responsible profession, it is pusillanimous to try to accomplish this under the cloak of license law nominally advocated to safeguard life, health and welfare. Other opponents of licensing hold that no license law yet proposed in the United States can, in its practical administration, give to a licensee the equivalent standing in the eyes of well-informed citizens that is given by membership in a body like The American Society of Mechanical Engineers, and until a law is proposed which will actually tend to increase public appreciation of the value of good engineering it is better to oppose licensing and continue striving, through publicity methods like those now used by the society and by other proper means, to attain this laudable end.

A Proposed Engineer's License Law for California.

Using the so-called model law drafted by the American Association of Engineers, California engineers have prepared an engineer's licensing bill for submission to the State legislature. Licensing laws are now effective in nineteen States and sentiment favorable to such regulations is crystallizing rapidly in other States.

Realizing that action undoubtedly would be taken toward passing a licensing law in California, the public affairs committee of the San Francisco Chapter of the A. A. E., made a detailed study of the license laws in effect in other States. Having before them also the bill drafted by the A. A. E., the committee has prepared a measure which its members believe will be acceptable to the profession in California. Feeling that much already had been accomplished in educating both engineers and the public generally to the value of such a law because of the passage of similar laws in nineteen States, the committee incorporated somewhat higher standards than in any yet adopted.

At the outset it was agreed that the purpose of a license law should be either (1) to protect life, health and property by establishing minimum qualifications for those desiring to practise engineering, or (2) to raise the standing of the engineer in the eyes of the public by defining the profession and giving it a legal status.

In studying the laws of other States, the committee found that eleven of the existing laws provide specifically for the first of these reasons—the protection of life, health and property, but there might be a question as to their effectiveness in carrying out the second purpose. It was concluded that the real purpose of the legislation in those States was the more selfish one of raising the standards of the profession by giving it a legal status.

A bill to license engineers, introduced in the California legislature in 1919, was allowed to die when it was found that the sentiment among engineers themselves was not unanimously in favor of it.

Like the New York law, the bill to be submitted in California, provides for a State licensing board of engineers. The provision of the New York statute requiring engineers to obtain a license to practise becomes effective May 5 next when the law will have been upon the law boks two years. Failure to obtain the license in New York is punishable as a misdemeanor.

University of Illinois Short Course on Heating and Ventilating.

The University of Illinois at Urbana, Ill., which offers one of the few courses on heating and ventilating available, has just completed a "short course" consisting of a series of lectures and laboratory demonstrations in heating and hydraulics.

Lectures on hydraulics cover the following subjects:

Pressure and head of water; velocity of flow.

Measurement of water; volume, weight, orifices, weirs, venturi meter, displacement meter, etc.

Losses of pressure in pipes, elbows, tees, and special fittings.

Water hammer in pipes.

Five laboratory demonstrations on hydraulics include: illustration of the use of various devices for measuring water; losses of pressure in pipes, tees and specials; meter testing; water hammer illustrated by experiments on 730 ft. of 2-in. pipe; thawing frozen pipes by electricity; tests of household and other pumps; construction and operation of household septic tanks; operation of a miniature sewage treatment plant for a municipality; water softening; and water filtration.

Lectures on heating include the following:

Methods of determining the heat loss from buildings; factors for walls, glass, roofs, and floors. Allowance for unheated spaces in heated buildings.

Methods of determining heat required to make up for air changes or the inleakage of air around windows and doors.

Heat supplied by various types of radiators; factors affecting the rate at which radiators give off heat; essential difference between steam and water radiators.

Fundamental principles involved in designing piping systems for steam and water heating; allowable velocities and pressure drops.

Heating boiler ratings; factors affecting the rating of a boiler or heater; draft, relation between combustion rate and efficiency, factors affecting water evaporated per square foot of heating surface, relation between combustion rate and draft, and relation between draft and boiler ratings.

Value and importance of insulation on pipes, heaters, tanks and smoke breechings.

Warm-air furnace heating systems and factors affecting performance of such systems.

Fans for fan-blast systems: methods of rating and testing fans.

Laboratory demonstrations on this subject include: testing direct steam radiators; determining critical velocity in a steam riser for one-pipe work; testing a steam heating boiler; testing a warm-air furnace; determining effect of covering on the heat loss of bare pipes; and rating test of fan for use in fan-blast heating.

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

PIPE LOSES

A New Formula for Computing Pipe Loses, Charles I. Corp. Wisconsin Engr., vol. 27, no. 2, Nov. 1922, pp. 25-27 and 37, 6 figs. Data on experiments conducted at Hydraulic Laboratory of Univ. of Wisconsin on loss due to flow in wrought-iron pipes to determine loss of head caused by valves; effect of diameter on loss of head. 50¢.

HEATING, HOUSE

France. Central House Heating (Du chauffage central). E. Allar. Associations Francaises de Propriétaires d' Appareils a Vapeur—Bul., vol. 3, no. 10, Oct. 1922, pp. 185-201, 9 figs. Describes different systems, including steam heating and hot-water heating; boilers and combustion; fuel consumption and temperature. 50¢.

HEATING, STEAM

Vacuum. Vapor Heating Systems, E. R. Pierce. Domestic Eng., vol. 101, Nos. 5, 7, and 9, Nov. 4, 18 and Dec. 2, 1922, pp. 173-175, 272-275, 365-367, and 402, 8 figs. Treatise on vapor and vacuum heating. Describes Gorton, Moline, Dunham vapor, McLear air-line vacuum, and vacuum-pump heating systems. 20¢ each.

STEAM

Tables, Reading of, Method of Reading Steam Tables Correctly, T. H. Fenner. Power House, vol. 15, No. 23, Dec. 5, 1922, pp. 21-23. Explanation of what each column in steam table means, and some examples of method of application to every-day problems. 30¢.

Building Shows This Month

In anticipation of spring building numerous communities have arranged "Home Beautiful" or "Own Your Home" expositions during April. Among those scheduled for the latter half of the month are the following:

April 21-28—"Own Your Home Exposition" Sixty-ninth Regiment Armory, New York City.

April 21-May 5—"Home Beautiful Exposition" Mechanics Building, Boston, Mass.

American Society of Heating and Ventilating Engineers

Chicago Selected for Summer Meeting.

Chicago has been selected as the summer meeting place of the American Society of Heating and Ventilating Engineers and the dates selected are May 21, 22 and 23. Directly following the meeting of the heating engineers and continuing through the remainder of the week will be the annual convention, in the same city, of the Heating and Piping Contractors' National Association.

Nominating Committee Appointed.

Samuel R. Lewis, of Chicago, has been named by the council of the American Society of Heating and Ventilating Engineers as chairman of the nominating committee for next year's nominations. The other members of the nominating committee are E. P. Bradley, St. Louis; E. C. Evans, Pittsburgh; Walter S. Timmis, New York, and Professor James D. Hoffman, Lafayette, Ind.

Illinois Chapter Hears of "Puff" System of Ventilation.

Discussing the heating, ventilation and air conditioning of small theatres at the March meeting of the Illinois Chapter at the Engineers' Club, Chicago, March 12, Dr. E. Vernon Hill presented details of a novel method of ventilating such buildings with what he termed a "puff" system. This method, he explained, is based partly upon the theory that short blasts of cool air are not only beneficial, but conducive to comfort. In the "puff" system the velocity of the incoming air is raised for 15-second intervals to 1100 ft. per minute and then dropped to 350 ft. per minute for 45 seconds. This he stated, gives the effect of an oscillating electric fan.

The fresh air supply is admitted through side wall openings and the air at different velocities is admitted through the various register openings consecutively that is, starting with the opening on each side of the auditorium at the stage end and working gradually towards the back of the house and then starting again at the front. In his design there were four divisions on each side of the theatre. While Dr. Hill did not advocate the "puff" system as a workable plan at present, the consensus of opinion was that it had considerable merit.

Charles D. Allan discussed a typical installation in a theatre with a capacity of 2,000 persons, the system being designed to supply 25 cu. ft. of air per minute for each person. It was brought out in the discussion that there is considerable recirculation of air in Chicago theatre buildings, although the ordinances do not permit such recirculation.

Other speakers were E. P. Heckel, of the Carrier Engineering Corporation, who showed a scheme for ventilating the same theatre building by means of a zone system, with a downward fresh air supply exhausting through mushroom ventilators on the floor, and George Blanding, of the Johnson Service Company, who explained the system which he had designed for the same theatre, in which he also used a zone system, but in which the air supply was through the mushrooms in the floor and the exhaust through registers in the rear of the theatre.

Annual Meeting of Philadelphia Chapter.

Philadelphia's pre-eminence as the home of the president of the American Society of Heating and Ventilating Engineers was reflected in the annual meeting of the Philadelphia Chapter, at the Engineer's Club, March 8, when the guests included Dean Anderson, director of the society's Research Laboratory; Past President J. Irvine Lyle and Secretary C. W. Obert. Others who were present and who spoke were President H. P. Gant, of the A. S. H.&V.E.; Past President John F. Hale, John D. Cassell, first president of the Philadelphia Chapter and George W. Barr, E. T. Murphy and C. V. Haynes.

New officers were elected as follows: President, Thornton Lewis; vice-president, Raymond Bolsinger; secretary, H. B. Hedges; treasurer, Alexander McClintock, Sr. Board of governors; the officers named and George A. Eagan, Frederick D. Mensing and Robert P. Schoenijohn.

Western New York Chapter Hears Talk on Recirculation.

Forty members and guests were on hand for the dinner of the Western New York Chapter, held March 5, at the Hotel Iroquois. Special music by a three-piece orchestra, together with plenty of songs, served to greatly enliven the occasion. An additional 25 arrived later for the meeting itself. President C. W. Farrar expressed regrets that E. E. McNair, chairman of the A. S.H. & V.E. Committee on Research, could not be present. He complimented Mr. Hutzel on the success of the programs which had been arranged during the season.

Dr. E. Vernon Hill, the speaker of the evening, gave a talk on the development of heating and ventilating, outlining the history of the art from the sixteenth century up to the present time. In speaking of future developments, he laid stress on the possibilities of using recirculated air in order to cut down the cost of ventilation. Recently-conducted experiments, he said, proved that where an air washer is used, together with ozone, 75% of the air can be recirculated, resulting in a saving of 50% in the coal bill.

The full list of the chapter's officers for 1923 is as follows: President, C. W. Farrar; first vice-president, O. K. Dyer; second vice-president, Hugo F. Hutzel; treasurer, C. P. Wadley; secretary, Roswell Farnham.

New York Chapter Discusses Recent Tendencies in Heating and Ventilating Practice.

The banner attendance of the year was the way the New York Chapter responded to the announcement that its president, Willis H. Carrier, would be the principal speaker at its March meeting, at the Building Trades Employers' Club, March 19. Every seat was filled when Chairman A. S. Armagnac of the Meetings Committee, opened the meeting and presented Mr. Carrier.

Mr. Carrier illustrated his talk with lantern slides which included views of the ventilating arrangements of the London County Council Building and the new psychrometric chart of the A.S.H.&V.E. with equal comfort lines or effective temperatures for still air.

Mr. Carrier first discussed the important phases of ventilation in the light of recent developments. Some of the points he made were that ventilating outfits should be large enough to permit their use for cooling purposes in the summer time, as it is desirable to produce drafts in warm weather, and that the inlet diffusers should be arranged to distribute the air definitely to all parts of the interior. Just now, he said, the cost of ventilation is a bigger factor than ever before. Care should be taken to balance the initial cost of the equipment and the cost of its operation. For that reason Mr. Carrier expressed the belief that we were going to go in more for recirculation, but that it was necessary to determine how far we can go in that direction without injuring health.

He emphasized the fact that in the ventilation of school buildings we raise the air temperature to 70° F. for ventilating, but we only have to raise it 20° more for the heating; in other words, only a 20° rise is applied to the air after the ventilation requirements are met.

One method of reducing the fuel bill, he said, is through limiting the air leakage through windows and the architects are now conducting tests to determine the leakage values of various types of window construction. Infiltration is also being studied by the same interests.

Discussing recirculation, Mr. Carrier characterized window ventilation as foolish because we cannot control it. The old standard of 30 cu. ft. per minute, he showed, was needed to dissipate body heat, sensible heat and moisture from perspiration and breath. These factors would result in a 12-degree rise in temperature in recirculated air and that range of cooling is about all we can do with safety.

Dust, said Mr. Carrier, is a real men-

ace and in dry air the dust becomes electrically charged, which causes the particles to break up and stand away from each other. This results in the dust being kept in suspension. Moisture, he said, is effective in precipitating the dust. Ozone seems to be beneficial but will not remove the dust, so that air washers become necessary, especially in recirculation work. It was easy to see that recirculation would save as much as 80% of the cost when all outside air was used, but if the building were tight, the CO_2 would become excessive, as would also the odors and the moisture content would increase. In such cases the air would have to be dehumidified. Admitting cold air from out-of-doors would accomplish this and he recommended the practice in zero weather of using three-quarters recirculation and one-quarter fresh outdoor air. As the temperature rises we must admit more outdoor air, and at 55° or 60° we must take all outdoor air. The greatest saving in recirculation is when the load is the heaviest.

Better distribution, said Mr. Carrier, is needed, and large air volumes so as to sweep the old air out of the rooms. To secure the proper diffusion he recommended an increase in the register areas and installation of diffusers behind the wall. The air, he said, should not flow straight out from the register.

In commenting on the zone of comfort, as disclosed by the new A.S.H.&V.E. psychrometric chart, he pointed out how the comfort lines approach the wet-bulb temperatures as the heat increases and approaches the dry-bulb temperatures under cold conditions.

In concluding Mr. Carrier showed a new centrifugal refrigerating system which is about to be placed on the market for use in air conditioning work. He also referred to some important new developments in the form of indirect heating surface in which use is made of copper to reduce the size of the units. These also, he said, would soon be placed on the market.

Fred. R. Still, vice-president of the American Blower Company, discussed the paper, stating incidentally that he was now a permanent resident of New York, and an applicant for membership in the New York Chapter. He made the statement that air washers used with ozone will kill odors and at the same time remove the smell of ozone. In St. Louis, he said, as the temperature rises outdoors a schedule is provided whereby more and more outdoor air is admitted.

St. Louis Chapter Hears Talks on Gas-Fired Boilers

A bright picture of the future of gas as applied to heating boilers was drawn by Mr. Whitelaw in an address on "Gas-Fired Boilers" at the February meeting of the St. Louis, Chapter, held February 15. The importance of applying gas only to boilers designed for this fuel was emphasized by Mr. Whitelaw, as when gas is used in coal-burning boilers, the stack losses are apt to be large, back-firing frequent and pilot lights are sometimes extinguished. The important points to consider, he said, in burning gas is to get the best combustion without draft tension to design a boiler that will absorb as much heat as possible, and to improve the design of burners. According to figures presented by Mr. Whitelaw the cost of gas heating in St. Louis compares as follows with soft coal, coke and anthracite:

Boiler	Gas	Soft Coal $7.50 per ton	Coke $12.50 per ton	Anthracite $16 per ton
Steam..... ..	.65	.28	.31	.41
Water	.40	.17	.19	.25

Following are the officers of the chapter for 1923: President, V. D. Rossman; first vice-president, Walter A. Klein; second vice-president, E. H. Sproull; treasurer, E. H. Quentin; secretary, Thomas Gale; board of governors: B. K. Milward, Walter Keiser, J. W. Cooper and C. J. Moritz.

New Officers of Ohio Chapter.

The following officers of the Ohio Chapter were elected at the chapter's annual meeting, February 9: President, James J. Mason; vice-president, Ernest Szekely; treasurer, W. C. Clark; secretary, F. D. Rollins; board of governors: F. H. Valentine, M. F. Rather and A. E. Welker.

Annual Meeting of British Heating Engineers

In an address which covered in an interesting manner the development of the Institution of Heating and Ventilating Engineers, the work it has in hand and its future possibilities, John Watson, the new president of the British institution, speaking at its annual meeting in London, February 6, gave a very clear conception of the way heating and ventilating engineering is coming to the front in England and of the renewed vitality of the institution.

Mr. Watson first preferred to the organization of the institution in 1898 and recalled the 1899 meeting which was the first one he attended. Possibly nothing had done more, said Mr. Watson, to enhance the prestige of the institution, and to help forward its progress, than the time and money it had spent on research work. He thought this fact was now generally recognized by the members and that they had realized that nothing should be allowed to impair the good work. Within the past three or four years, he said, part of the funds obtained through voluntary subscriptions had been provided by the government grants on a pound for pound basis, and this he mentioned as an additional reason why the contributions of members should not lag.

DISTRICT HEATING PROJECTS FOR ENGLAND.

The important question of the economical production and use of power, he said, was engaging the attention of the institution's district heating committee, in collaboration with a committee of the Institution of Electrical Engineers. As he pointed out, "motive power is the life blood of our modern civilization and when it is recollected that 100 years ago such hardly existed, one appreciates the gigantic strides made since Watt gave us the first practicable steam engine, so opening up a vista the end of which no one man can foresee."

After discussing the production of motive power, Mr. Watson referred particularly to the heating engineers' interest in exhaust steam in connection with the Electricity Commissioners' proposal to build a series of super-power stations for the supply of electric current to the whole country for the production of cheap motive power.

"Under that scheme," he said, "the majority of the existing generating stations would be shut down, and, as many of them were conveniently situated for heat distribution, the proposal is to utilize them as combined heat distributing and electric generating stations, linking them up with the super-stations for the supply of electricity in excess of the station's capacity. By this means the great waste of plant involved by scrapping existing stations would be obviated, and those stations would become—first and foremost—centers for heat distribution, the exhaust steam being fully utilized."

The importance of standardizing the methods of testing and determining the capacity of fans, and introducing a glossary of terms, as between makers and users, had been recognized by the appointment of a strong committee, which was giving the subject the keenest consideration. This committee consists not only of members of the council and representatives from various fan manufacturers, but also representatives from government departments, including the Admiralty.

For the Research Committee, Chairman E. Herring told of the work that had been done at University College, consisting of further investigations of the heat emission of various types of radiators and preparations for the proposed tests of thin building materials. Mr. Herring said he hoped to be in a position to report the final results of radiator tests at the summer meeting, after which a bulletin would be issued giving a full description of the methods of testing and a complete table of emission coefficients. Bulletin No. 1, he added, the publication of which had been delayed, was at last in the printer's hands and would shortly be ready for distribution.

For the Fan Standardization Committee, W. Yates stated that the first draft had

been completed of the complete list of terms used in fan work, together with a comprehensive definition of each. The committee is now developing a standard method of testing, together with a schedule of instruments used for testing purposes. It has not yet reached an agreement as to the exact meaning of static head and total head and their relative values in fan work.

For the Boiler Rating Committee, Chairman W. W. Nobbs stated that the committee had been in negotiation with several boiler manufacturers with reference to the submission of their boilers for testing. Nearly everything was ready for the tests, the final piece of apparatus, the constant head instrument, which was a most important part, being still to come.

The formation of a technical library is proceeding and a book plate is being designed, comprising a copy of the badge of the institution, with a space for recording the name of the donor.

W. E. Garner, M. Sc., presented the technical paper of the meeting on "The Combustion of Fuels in Boiler Furnaces."

It was announced that the summer meeting would be held in Folkestone, June 18-20.

The meeting concluded with the presentation of a lantern slide showing a chart prepared by M. Kinoshita, giving the results of the numerous tests made on radiators up to the present.

The institution now has 509 members, made up of 4 honorary life members, 20 life members, 352 members, 120 associate members, 1 honorary associate, 2 associates and 10 graduates.

Wages Higher Than Living Costs.

That wages are higher than living costs is disclosed by tables compiled by the National Association of Building Trades Employers covering the relation between wage advances and the cost of living in fourteen representative cities. The tables were compiled from a series of wage compilations, gathered and published by E. M. Craig, of Chicago, from data on the subject issued by the United States Department of Labor.

The following table shows the scale of wages as paid each year, from 1914 through 1922, to the heating and plumbing trades in fourteen principal cities:

Year	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.	1922.
ATLANTA, GA.									
Plumbers	.50	.50	.50	.62½	.75	.75	.87½	1.00	.85
Steam Fitters	.45	.45	.45	.56¼	.75	.75	.87½	1.00	.85
BOSTON.									
Plumbers	.65	.65	.68¾	.68¾	.75	.90	1.00	.90	1.00
Steam Fitters	.56¼	.62½	.62½	.68¾	.75	.90	1.00	.90	1.00
BALTIMORE.									
Plumbers	.50	.50	.50	.56¼	.75	.87½	1.00	.90	.92½
Steam Fitters	.50	.50	.50	.50	.75	.87½	1.00	.90	.90
CHICAGO.									
Plumbers	.75	.75	.75	.75	.81¼	1.00	1.25	.95	.95
Steam Fitters	.75	.75	.75	.75	.81¼	1.00	1.25	.95	.95
CINCINNATI.									
Plumbers	.62½	.62½	.62½	.65	.65	.80	1.00	.87½	.95
Steam Fitters	.60	.62½	.62½	.62½	.65½	.81¼	1.00	.87½	.95
CLEVELAND.									
Plumbers	.62½	.68¾	.75	.75	.90	1.00	1.10	1.10	1.10
Steam Fitters	.62½	.62½	.75	.75	.81¼	1.00	1.25	1.04	1.10
DETROIT.									
Plumbers	.55	.55	.65	.75	.75	1.00	1.10	.90	1.10
Steam Fitters	.55	.55	.55	.65	.75	1.00	1.10	.90	1.10
INDIANAPOLIS.									
Plumbers	.62½	.62½	.67½	.67½	.75	.87½	1.00	1.15	1.12½
Steam Fitters	.62½	.62½	.67½	.67½	.75	.87½	1.00	1.15	1.12½
KANSAS CITY, MO.									
Plumbers	.75	.68¾	.75	.75	.87½	1.00	1.00	1.25	1.12½
Steam Fitters	.75	.75	.75	.75	.87½	1.00	1.00	1.25	1.12½
NEW YORK.									
Plumbers	.50	.50	.50	.56¼	.75	.72½	.85	.90	.90
Steam Fitters	.63¾	.63¾	.63¾	.75	.75	.75	1.12½	1.12½	1.12½
PHILADELPHIA.									
Plumbers	.50	.50	.50	.56¼	.75	.72½	.85	.90	.90
Steam Fitters	.50	.50	.45	.56¼	.75	.75	1.25	.90	.90
PITTSBURGH.									
Plumbers	.62½	.68¾	.68¾	.75	.81¼	.93¾	1.06¼	1.00	1.12
Steam Fitters	.62½	.62½	.68¾	.75	.80	.97½	1.15	1.00	1.12½
ST. LOUIS.									
Plumbers	.66¼	.75	.75	.75	.81¼	1.00	1.25	1.25	1.25
Steam Fitters	.75	.75	.75	.75	.75	.87½	1.25	1.25	1.25
WASHINGTON, D. C.									
Plumbers	.50	.56¼	.56½	.56¼	.75	.87½	1.00	1.06¼	1.06¼
Steam Fitters	.52½	.57½	.62½	.62½	.75	.92½	.92½	1.06¼	1.06¼

Chamber of Commerce of the United States to Meet in New York, May 7-10, 1923.

Based on the consideration that transportation in the United States is rapidly reaching the limits of its capacity and that within the next decade or so radical steps will have to be taken involving possibly railway consolidations and development of waterways and motor traffic on a stupendous scale, the Chamber of Commerce of the United States at its annual meeting in New York, May 7-10, next, will schedule as one of its major topics "Transportation in All Its Phases in the United States." The other leading topic will be "Europe and Europe's Affairs."

Because of the interest of business men through the country in the two general subjects it is expected that the convention will be one of the largest ever held by the chamber. Representative business organizations in every state in the Union have been asked to send delegates, and an attendance of from 4,000 to 5,000 business men is looked for.

Transportation will be the keynote of the meeting as it is the keynote of virtually every business discussion over the country these days. Already the National Chamber is engaged on a comprehensive study of the whole problem from every point of view, hoping to aid in the ultimate formulation of a national transportation policy. Special committees of the conference, dealing with specific divisions of the general question, will be in session at the time of the annual meeting and the discussion of transportation subjects at the big meeting in New York naturally divides itself into lines similar to the committee work of the conference.

Representatives of railroads, shipping interests, producers, the motor industry, waterway operators and the public are included in the conference make up and also will be heard before the annual meeting. The aspects they will discuss at the meeting include governmental relations to transportation, railroad consolidations, rate schedule readjustments, coordination of motor transport and waterway carriers.

Other subjects which will have a prominent place in the deliberation are "Railway Rates in Their Relation to Distribution," "Transportation Obstructions to Distribution," "The Effect of Freight Rates on Manufacturing Costs," and "Setting up Quality Standards in Commodity Production."

National Association of Building Trades Employers.

Probably the most debated and discussed question at the fourth annual meeting of the National Association of Building Trades Employers in Des Moines, Ia., February 15-16, was apprenticeship. This discussion followed an exhaustive paper on the subject by Gerhardt F. Meyne, of Chicago. The retiring president, Walter Klie, of Cleveland, who is a well-known heating contractor, was succeeded by A. E. Coleman, of Chicago. Mr. Coleman's address was replete with sound sense on the problems of the day. One of his epigrams was that "associations are cheaper than strikes."

A discussion of the National Board of Jurisdictional Awards drew forth a comment from E. M. Craig, of Chicago, that the labor members of the board can determine its decisions by their vote.

Mr. Craig explained that labor has three members of the board, contractors have three members and there are two members representing architects and engineers. Therefore, not even though the architect and the engineer vote combined with a unanimous labor vote could a decision be given, because it takes six to effect a decision.

F. R. Still Now a New Yorker

Fred. R. Still, vice-president and general manager of the American Blower Co., Detroit, Mich., has moved his headquarters to New York, where he will be permanently located. This move does not affect the executive offices of the company which will remain in Detroit. Most of the large undertakings, Mr. Still states, start in New York and the change has been made so as to put the company into closer touch with such undertakings as they develop. Mr. Still will have his office at the New York branch of the American Blower Co., 50 Church St.

The Pittsburgh Building Show will be held at Motor Square Garden, in Pittsburgh, Pa., May 26-31, under the auspicies of the Pittsburgh Builders' Exchange.

The Landis Award and Its Effect on the Chicago Building Industry

In the early part of 1921, building began to boom all over the United States. Chicago shared in the boom. Month after month the volume of building permits rose steadily and swiftly. There was, necessarily, a tremendous demand for labor. And then the unions struck.

Abruptly, building ceased. Buildings only half finished stood waiting the resumption of work. Plans for new constructions were pigeonholed. For lack of new buildings, rents rocketed skyward. The unions and the employers, in the meantime, were dead locked. No agreement seemed possible.

At length, in June, finding that they could make no progress toward a settlement of the struggle, the two factions agreed to submit the case to an arbitrator. They agreed, too, in naming Judge Kenesaw M. Landis as the referee, and pledged themselves to obey his decision. Four days later, when Judge Landis accepted the task, both workmen and contractors rejoiced; but the greatest joy was that of the public, for now, apparently, there was to be a definite and final settlement of the building question. And all the public wanted was more houses.

There was, however, no settlement. Judge Landis performed his duties as an arbitrator. He performed them carefully. On September 7, after three months of consideration, he announced his decision.

No resident of Chicago has forgotten the storm that followed the publication of the terms of the Landis Award. When the noise died away two things were apparent: The contractors were willing to accept the award and the unions were divided.

The provisions of the award were simple and direct. It recognized the principle of the closed shop and it proposed a cut of approximately 20 per cent. from the uniform wage of $1.25 an hour demanded by the unions. But it did not accede to the demand for a flat rate for all trades; it attempted, rather to fix wages in proportion to the degree of skill and the amount of training required in the various trades. It included, in addition, a number of specific modifications of the existing restrictions upon construction. Among these modifications was a provision that all subsequent disputes should be settled by peaceful arbitration, with no stoppage of work, either individually or collectively, by employer or by workman.

The Landis Award was, at the least, a thoughtful decision. Judge Landis had tried to see the problem from the viewpoint of the public, "the great unrepresented party to this arbitration," and every clause of the award was designed to secure the two things desired by the public, the acceleration of building and the prevention of future disputes.

From the beginning there had been seven trades, including the carpenters and the plasterers, that had refused to submit their case to arbitration. The award, however, announced the wage rates upon which the referee would have determined if these trades had been parties to the arbitration. It was generally believed that the unions concerned would fall into line, although they never had been pledged to acceptance of the award. But they refused, flatly and definitely. And to complicate the situation three of the other trades repudiated their pledges.

This, then, was the situation in Chicago in the fall of 1921: The large and unified body of contractors was willing to obey the Landis Award; the great majority of the building trades were ready to stand by their pledge to accept the award; and a small group of ten trades, holding out for the full terms of the original demands, refused to recognize the authority of a single phrase in the whole award. And these ten trades were essential. The deadlock was unbroken.

In this emergency a new organization appeared. It called itself "The Citizens' Committee to Enforce the Landis Award." The title, indeed, was well chosen; this was not a committee of contractors; it was an association of determined citizens. There was not a builder on its executive committee. Thomas E. Donnelley, the chairman, was the head of a printing house. John T. Pirie, one of the members of the executive committee, was a department store proprietor. Charles Piez, another member, had been at the head of the Shipping Board during the war and was now a manufacturer of chain belt. These three were typical members.

What had happened was that the public had finally sat into the game with a big pile of chips and a winning hand.

From that time until the present the Citizens' Committee has been engaged in the task of keeping building on the go. Its first act was to declare the ten refractory trades outlawed and to undertake to bring in enough workmen to fill the gaps. So far as those ten trades were concerned, Chicago was to be "open shop." The committee has succeeded. It has brought to Chicago more than 20,000 men to replace the members of the "outlaw" trades, which by later accretions grew from ten to thirteen. With the aid of these "imported" craftsmen and with the cooperation of the majority of the unions in the building trades, the committee has pushed building construction steadily, and satisfactorily.

So successful, indeed, was the work of the committee that when in February, 1912, the "outlaw" trades offered to accept the terms of the Landis Award, the committee refused to accept the surrender. The "outlaw" trades, the committee ruled, had had their chance and lost it. In those trades the open shop would continue.

Thus the dispute in Chicago is no longer a dispute over the Landis Award. The question now is the old one of "closed shop" or "open shop." That, however, is beside the point. What is of greater interest is the fact that during 1922, when building has been going steadily forward in Chicago, more than 80 per cent. of all the construction has been done by Landis Award contractors cooperating with the Citizens' Committee.—CARROLL Y. BELKNAP *in the Business Magazine.*

St. Louis Technical Institute's Course in Heating and Ventilating Engineering.

Supplementing its course on "Studies in Sheet Metal," the St. Louis Technical Institute has prepared a course in heating and ventilating engineering covering the fundamentals of the art.

Among the items taken up are studies in fuel-coal and oil and types of heaters, mensuration, warm-air furnace heating, steam and water heating, indirect heating and ventilating construction, and heating and ventilating technology. Under "Practical Heating Plan Designing," the student is supplied with plans of installations with instructions for working out the calculations. Opportunity is also given to him to prepare his own designs.

In this course there are about 22 different sets of lessons, each set requiring from ten days to six weeks to master. By average study, it is stated, the course can be mastered in from 18 months to two years. The tuition fee is $80.00, or $90.00 if paid on monthly basis of $10.00 with enrollment and $5.00 per month thereafter until paid for.

Use of Bituminous Coal in Gas Manufacturing.

Unless scientific study can improve the economy of existing processes for manufacturing illuminating gas, or show the possibility of using cheaper grades of coal and oil, the rising cost of those two commodities will eventually necessitate increases in gas rates, in the opinion of L. D. Tracy, superintendent of the Central District Experiment Station of the Bureau of Mines.

In spite of the fact that gas has been manufactured for public use for more than a century, many phases of the processes employed are not understood, even by gas operators, Mr. Tracy points out.

The Bureau of Mines central district station has made a notable contribution on the subject through the use of bituminous coal in the manufacture of carburetted water gas, the kind distributed by a majority of the companies which supply gas to approximately 4,500 cities in the country. Anthracite coal or coke usually is employed in making this form of gas. The high cost of these fuels and the acute shortage in some sections, caused engineers to turn to bituminous, which, Mr. Tracy says, can be used quite successfully. Its use, however, requires a change in operating methods and is beset with some difficulty. A number of middle western and eastern plants are now using bituminous coal for making carburetted water gas, and some companies have avoided increasing rates which would have been necessary had only coke or anthracite coal been available.

Portable Unit Ventilators

4—Universal Heating and Ventilating Units.

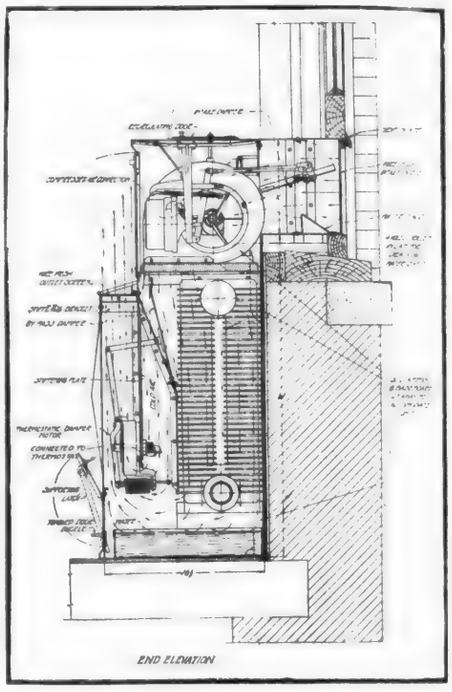
As can be readily appreciated, the heart of a portable unit ventilator lies in the motor, inasmuch as the success of the unit depends upon a constant distribution of air with as noiseless operation as possible, and upon the least possible attention. With that end in view, John J. Nesbitt, Inc., of Atlantic City, N. J., in connection with the General Electric Company, has developed a motor for a portable unit ventilator, the feature of which is a phosphor-bronze bearing, together with a waste-packed oil device which makes it necessary to oil the motor but once in six months. Particular attention is called to the brush setting and the easy accessibility of the commutator.

This motor is characterized as a high development of a fractional horsepower D.C. motor, special attention being directed to its quiet operation.

The motor, with Sirocco-type fans, is mounted on a transite asbestos board. This board is used to eliminate the use of felt which would be necessary in the case of a steel or wood board. If felt were used and should become saturated with oil and dirt, the incoming air, which would pass over the felt, would be likely to absorb some of the dirt. Transite asbestos board, it is added, being a non-conductor, aids materially in reducing the vibrating noise.

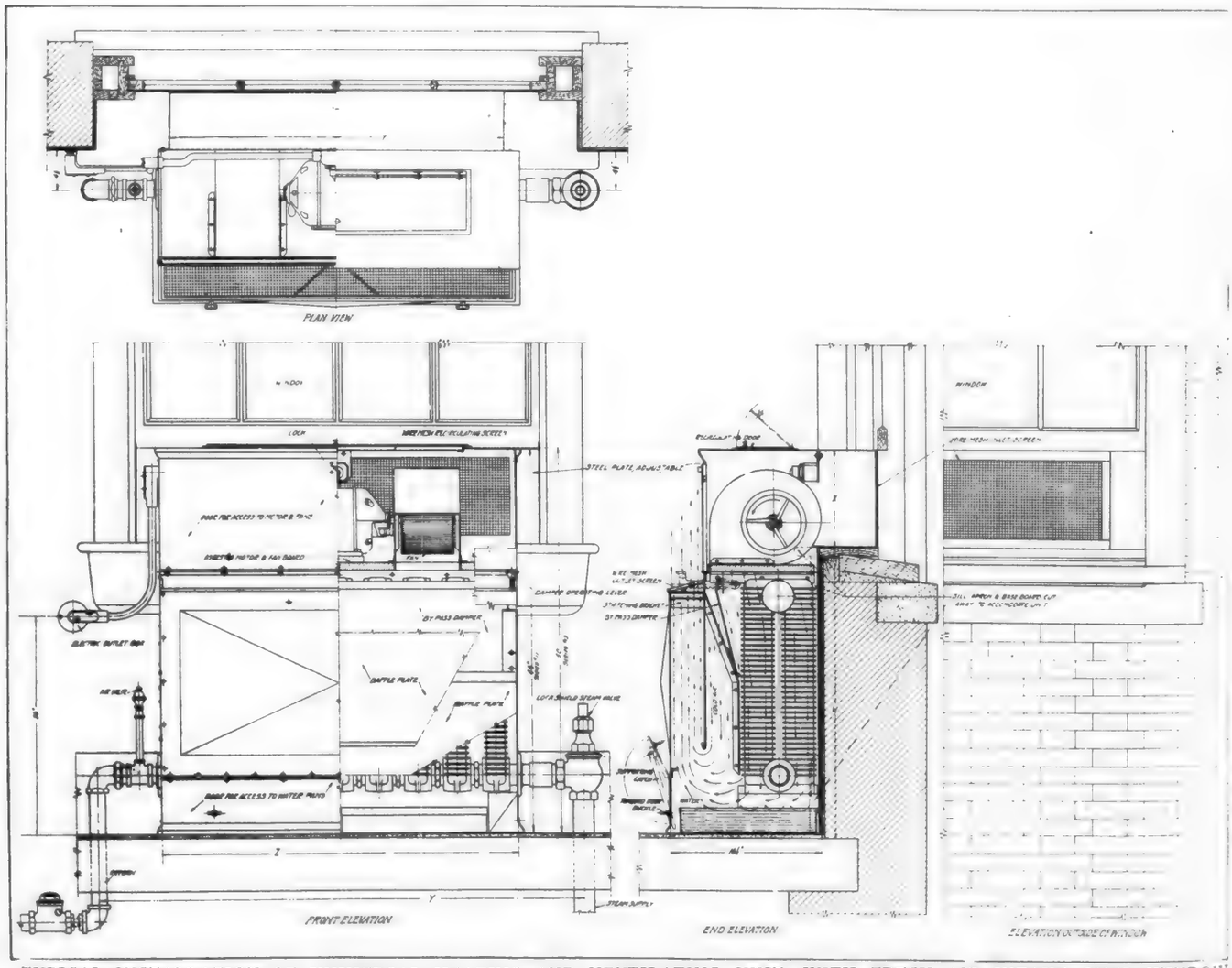
The radiator used in the Universal units is of the extended-surface aerial type, permitting a diffusion of air through its entire section, thus making for maximum efficiency.

The ventilating cabinet is made of No. 16 and No. 18 gauge steel, commonly known as furniture steel. It is cold rolled, pickled and stretcher-leveled. An arrangement is made for the incoming air to pass over water which is designed not only to supply humidification, but also to cleanse the air and deflect it upwards. Arrangements are also made for by-passing the air either by means of a hand control lever or where a thermostatic control is used for the installation, or by thermostatic control of the by-pass damper.



END ELEVATION OF UNIVERSAL HEATING AND VENTILATING UNIT.

In the sale of this product the manufacturer takes pains to state his belief that a manufacturer of mechancial ap-



TYPICAL INSTALLATION OF UNIVERSAL HEATING AND VENTILATING UNIT, WITH FRESH AIR INTAKE OVER WINDOW SILL, USING SASH FOR INTAKE DAMPER AND WITH MANUAL OPERATION OF BY-PASS D AMPER.

par... should concern himself both with the installation of his equipment and with its maintenance, in other words, his interest should rather begin with the sale than end with it. In the field of unit ventilation, it is stated, this matter is of vital importance. For that reason the Universal heating and ventilating units are sold and installed only by the manufacturer. Personal instruction by sales engineers is given to janitors and all those concerned with the care and operation

RATINGS OF UNIVERSAL HEATING AND VENTILATING UNITS.

RATINGS			
SERIES NUMBER	CU. FT. OF AIR PER MINUTE	CU. FT. OF AIR PER HR.	B.T.U.
11-36	600-900	36000-54000	60000-100000
11-40	901-1200	54060-72000	100000-120000
11-44	1201-1500	72060-90000	120000-129000
11-48	1201-1500	72060-90000	129000-148000

CONDENSATION			
SERIES NUMBER	ENTERING AIR TEMPERATURE	FINAL TEMP.	CONDENSATION. LBS. PER HR.
11-36	0 DEG. F.	80 DEG. F.	60 - 100
11-40	0 DEG. F.	80 DEG. F.	100 - 120
11-44	0 DEG. F.	70 DEG. F.	120 - 126
11-48	0 DEG. F.	80 DEG. F.	126 - 148

DIMENSIONS.					
SERIES NO.	Z	Y	X	W*	T
11-36	36½"	51"	9"-12"	32-36	NOT LESS THAN- 32⅜"
11-40	41½"	56"	8"-12"	32-36	" " " 37⅜"
11-44	45½"	61"	8"-12"	32-36	" " " 41⅜"
11-48	50½"	66"	8"-12"	32-36	" " " 41⅜"

* WHERE THIS DIMENSION MUST BE GREATER BECAUSE OF CONSTRUCTION, UNITS ARE SET ON WOODEN SUB-BASE.

TAPPING SCHEDULE.	
GRAVITY STEAM HEATING SYSTEM.	
2" SUPPLY	1" RETURN.
ATMOSPHERIC OR VAPOR STEAM SYSTEM.	
2" SUPPLY	2½" RETURN.
VACUUM SYSTEM OF STEAM HEATING.	
1½" SUPPLY	2½" RETURN.

of this equipment as soon as the equipment is in operation. This is supplemented by written instructions sent to the superintendents, janitors, etc. Also during the first year of their installation, frequent inspections are made to insure that the operation and maintenance of the equipment is carried on in the proper manner.

Prior to the beginning of the heating season every year, an annual inspection is made by one of the company's sales engineers, in order to instruct any new person and to observe whether the equipment is properly cared for. This service is rendered free of charge to the consumer, architect or engineer.

How Profits Increase As Number of Varieties Carried in Stock Is Reduced.

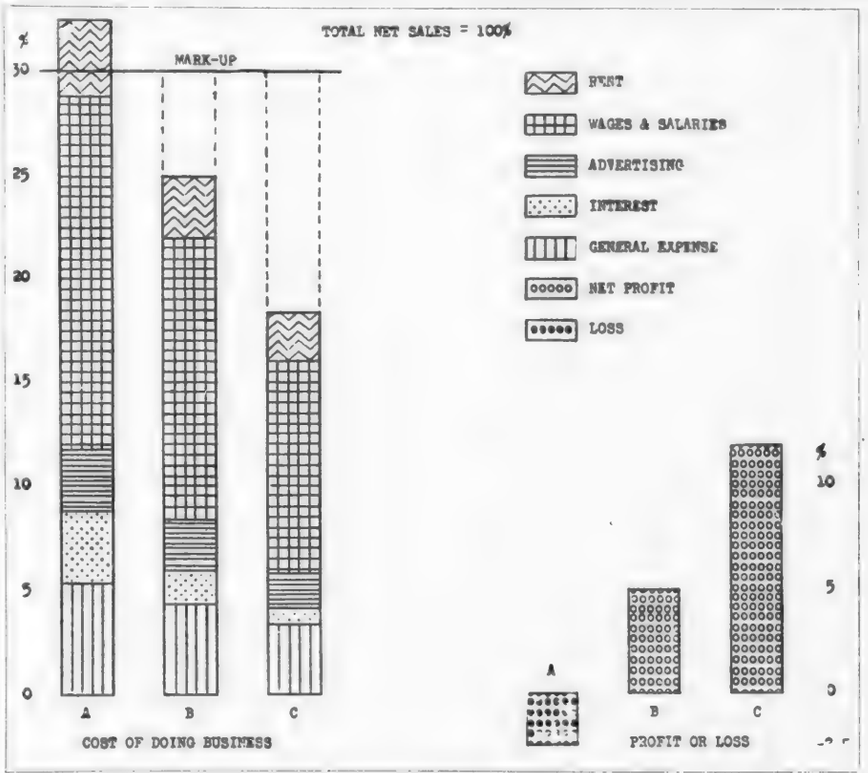
The advantages which result from a reduction in the number of varieties carried in stock by manufacturer, wholesaler or retailer, are graphically shown in a pamphlet just issued by the Chamber of Commerce of the United States. The publication, entitled aptly enough "A Commercial Tower of Babel" is a further discussion of the subject of simplification, a problem of merchandising which caused grave concern during the World War.

Varieties, sizes and seasonal changes in merchandise constitute a sky-piercing Tower of Babel, the pamphlet states. Through utterly useless competition, variety has been piled upon variety with its resultant great increase in the cost of distribution.

The accompanying illustration is designed to show the effect upon costs of doing business and upon profits due to increasing or decreasing the number of varieties carried in stock. Column B is an assumed average condition with a spread (or mark up) equal to 30% of the retail price. The shaded portions are the usual expenses and the unshaded portions are the profits, if any, which in Column B amount to 5% on the net sales.

It is not reasonable to suppose that all the expenses would be reduced one-half by reducing or increasing the number of varieties in that proportion (except in the interest on stock investment); hence, all other expenses than interest are reduced or increased by only one-quarter when the number of varieties is divided or multiplied by 2.

In the lower right-hand group the three columns illustrate the effects obtained from decreasing or increasing the number of varieties. In Column C a reduction in the number of varieties to one-half of those in Column B has increased the profits on the investmentt from 5% to nearly 12%; and doubling the number of varieties in



EFFECT UPON COST OF DOING BUSINESS AND UPON PROFITS DUE TO INCREASING OR DECREASING THE NUMBER OF VARIETIES CARRIED IN STOCK.

Column A has brought a loss of 2½%.

Thus it is shown that one-half as many varieties signifies no more nor less than one-half the investment in stock. Just as logically, reducing the number of items increases the possibility of a more rapid turnover and greater profits.

Of course there are other important factors to be considered, such, for example, as competition, but it would seem that there is every merchandising reason (except the advertising value of novelties) for a reduction in the number of items contained in the inventory of an establishment. The whole theory of business has a financial basis and the investment of capital, whether owned or borrowed, is the largest single factor in business.

The Domestic Distribution Department of the Chamber of Commerce of the United States, which prepared the argument for simplification, offers to cooperate with any business or group of businesses in effecting standardization or simplification of its products.

Organization of the Swartwout Company.

An item appearing in THE HEATING AND VENTILATING MAGAZINE for February, 1923, gave the particulars of the organization of the Swartwout Company, of Cleveland, O., which was formed to take over all the lines of sheet metal and other products of the Ohio Body & Blower Company. In that item the name of the company appeared as "Swartout". This error of course, was obvious to most of our readers to whom the name of Swartwout has long been familiar. The new company, as was stated in the item referred to, has been capitalized at $500,000. D. K. Swartwout, the president, was formerly president new company's products include ventilat- of the Ohio Body & Blower Company. The ors, steam specialties, exhaust heads, steam and oil separators, steam traps and feedwater heaters.

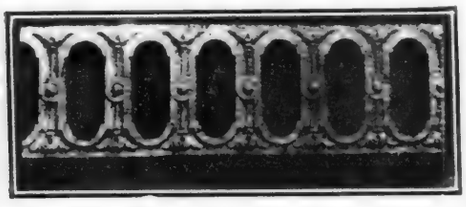
In addition to President D. K. Swartwout, the officers are: Vice-presidents, W. M. Pattison and D. K. Swartwout, Jr.; secretary and treasurer, W. E. Clement. The company's headquarters are in the building formerly occupied by the Cleveland Milling Machine Company, on Euclid Avenue, Cleveland, and it is also operating the plant which it took over from the Ohio Body & Blower Company, in Orville, O.

New Apparatus and Appliances

Ironite Air Grilles.

Using a material known as Ironite because of its similarity, in appearance and practical uses, to iron and bronze, Jacobson & Co., 241 East 44th St., New York, manufacturer of artificial stone for interiors, has brought out a line of air grilles which have many unique features. The chief ingredients of the grilles are cement and iron, a combination which produces a smooth surface the color of metal, with, it is stated, the firmness and durability of cast-iron and bronze.

One of the most desirable features of the material lies in its adaptability to the casting of undercut oramental details which would be impossible in iron casting and at the same time allowing the utmost liberty to the designer for the delicate modeling secured in bronze casting.



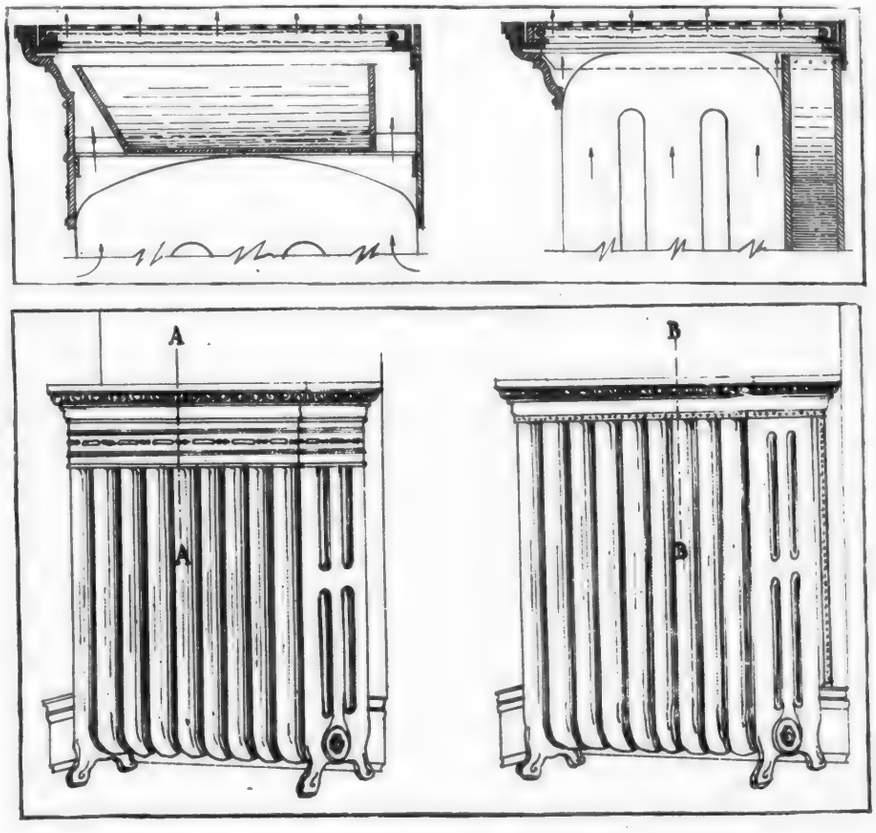
TYPES OF IRONITE AIR GRILLES.

Ironite, it is stated, is impervious to the effects of heat or color, either interior or exterior, and, it is added, will not crack if made in sections not over 5 ft. square. The cost of manufacture is approximately one-third that of iron and one-fifth that of bronze.

Humidifier and Dust Arrester.

A combined humidifier and dust arrester for domestic use has been designed by M. A. Garrett, of Chicago, and is now being marketed under the name of the Climax radiator top by the International Radiator Top Co., 1126 East 47th Street, Chicago. It is described as the only radiator top with the features mentioned. The top consists of a large capacity water reservoir and it will be seen that there is also a screen mounted on a frame extending the full length of the top. It is made of galvanized iron and comes primed with gray color ready for finish with radiator.

The Climax radiator top is furnished in two styles. The No. 1 pattern designed for general application. It stands 4 in. above the sections and it is recommended that shorter sections be used to maintain good proportions. The No. 2 pattern is intended for places where space at the top of the radiator is limited. Although standing only 1 in. above sections, the water reservoir is 2 in. broad and covers the entire back of the radiator. The tops are listed at $4.75 per lineal foot either pattern.



TYPES OF CLIMAX HUMIDIFIER AND DUST ARRESTER.

New Type of Electric Heater.

A new type of heater, known as the Type MP, for use especially in ticket booths, has been designed by the Westinghouse Electric & Mfg. Company. The heater is 20 in. long and can be attached to the side of a booth or similar enclosure by screws. A three-heat snap switch gives the desired range of regulation. The heaters are of black Japan finish and are supplied for 110 and 220-volt circuits.

NEW ELECTRIC HEATER FOR SMALL ENCLOSURES.

New Publications.

STEAM—ITS GENERATION AND USE, being the sixth issue of the thirty-sixth edition, has been issued by the Babcock & Wilcox Co., New York. "The Early History of the Generation and Use of Steam" is treated in an interesting manner, followed by an article giving a "Brief History of Water-Tube Boilers." Under "Requirements of Steam Boilers," attention is called to the fact that the list of requirements, as prepared by George H. Babcock and Stephen Wilcox, in 1875, represents the best practice today. The evolution and advantages of the Babcock & Wilcox boiler are discussed at length. Other matter treated in detail are heat and its measurement, the theory of steam making, properties of water, boiler-feed water, feed-water heating and methods of feeding, properties of saturated and superheated steam, properties of air, combustion, analysis of flue gases, classification of fuels, determination of their heat value, and combustion of coal and other fuel. Special chapters are also allotted to liquid fuels and gaseous fuels. Utilization of waste heat is then discussed, together with chimneys and draft. The book concludes with a discussion of the flow of steam through pipes and orifices

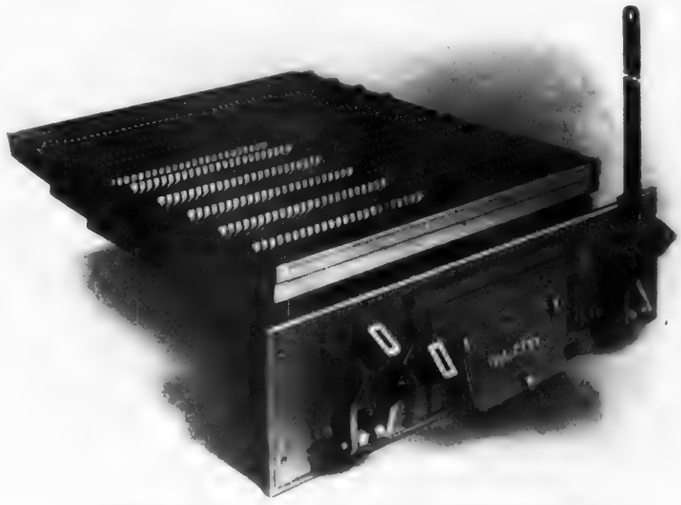
and heat transfer. Size 7 x 10. Cloth, pp. 336.

PATENTS—LAW AND PRACTICE, AND TRADE-MARKS—TRADE NAMES AND UNFAIR COMPETITION have recently been published in their second and third editions, respectively, by Richards & Geier, patent and trade-mark attorneys, 277 Broadway, New York. The booklet on trade-marks contains the salient features of the trade-mark law and practice, together with a discussion of the difficult subject of unfair competition. Both booklets have been placed in the libraries in many sections of the country and are available, on request, to responsible manufacturers and merchants. Size of "Patents" 6 x 9 in. Pp. 56. Size of "Trade-Marks," 6 x 9 in. Pp. 46.

A STUDY OF AIR-STREAM MIXTURES, by L. A. Wilson and C. R. Richards, has been published as bulletin No. 131 by the Engineering Department Station of the University of Illinois. This study is the outgrowth of an investigation of the reheating of compressed air, by C. R. Richards, former director of the Engineering Experiment Station and dean of the College of Engineering, and J. N. Vedder, research assistant in mechanical engineering, the results of which were presented in a former bulletin, No. 130.

New Trade Publications

OIL CITY ALL-STEEL FIREBOX BOILERS, for steam and water heating, described as the result of 45 years of practical experience, are presented in a useful catalogue (No. H-9) issued by the Oil City Boiler Works, Oil City, Pa. Any kind of fuel, it is stated, can be burned in these boilers with safety and with the assurance of securing high efficiency. The fire boxes are described as large, insuring ample combustion space. Complete information is given of the company's line, including specifications, ratings and weights. All of the boilers are of the return-tubular fire-box type. First place is given to the portable type, direct draft.

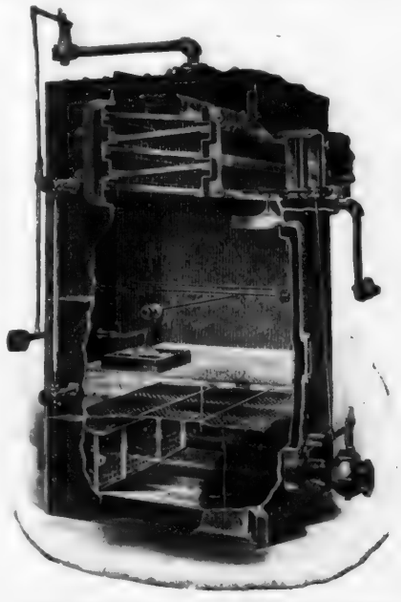


CONSTRUCTION OF OIL CITY ROCKING GRATE.

Next comes the smokeless down-draft type, followed by the direct-draft, brick-set type, and concluding with the brick-set smokeless down-draft type. Special mention is made of the Oil City rocking grates in which the end and side pieces comprise a frame on which the grate bars operate. These bars interlock at the corners, making the grates a unit independent of the furnace walls for support, ample space around the grates being provided for expansion and contraction. The grates are interchangeable, making it possible, if a change of fuel is desired, to substitute grate bars with lower or smaller air openings. This may be done without making any changes in the supporting frame, shaking mechanism or ash-pit front. On the last page of the catalogue the results are given of a test of a No. 810 Oil City heating boiler of the down-draft type, in which an efficiency was obtained of 74.6%. Size 7½ x 10½ in. Pp. 16.

EXCELSO QUALITY WATER HEATERS, as installed under various conditions, are shown in a new bulletin issued by the Excelso Specialty Works, Buffalo, N. Y. Among the illustrations is a typical installation with the water heater cross-connected with an automatic gas water heater. Another view shows a heater connected to a heating boiler in the basement with storage tank in the kitchen, while there is one showing a battery of Excelso heaters connected up for larger requirements, and one showing an Excelso connected to a steam boiler above the water-line, using live steam to heat the domestic water. The construction of the heater is explained, accompanied by dimension tables for the eight sizes furnished.

WEBSTER FEED-WATER HEATERS, rectangular cast-iron types, are discussed at length, with numerous illustrations and full data, in a new catalogue (Bulletin 102A) issued by Warren Webster & Co., Camden, N. J. This heater is made in five types, of capacities ranging from 300 to 12,000 H. P. In addition, the catalogue shows a wrought-iron type, designed especially to take care of the strains due to unequal expansion due to temperature differences in the various parts of a feed-water heater. As the catalogue states, under ordinary operating conditions the universally-used cast-iron shell construction should meet this condition, but leakage at the joints and even cracking of cast-iron shell plates sometimes result from exposure to excessive temperature differences. These heaters are of rectangular pattern for all capacities except the largest. The interesting statement is made in the catalogue that more than 7500 Webster heaters, aggregating nearly 5,000,000 H. P. are in use. The various points of advantage are taken up in detail, such as direct contact of the water with the exhaust steam, utilization of drips as feed-water, the large storage space below the level of flow, ease of cleaning, efficiency due to the fact that the heater is sealed from the atmosphere, and to the fact that it is not a thoroughfare for all the engine exhaust. Attention is also called by the manufacturer to its automatic operation while the design and workmanship is featured as being up to the highest Webster standard. Numerous views of typical installations are shown. One of the views of the apparatus shows it combined with the Lea V-Notch recording meter and featured as the Webster Lea Heater-Meter. It is so arranged that either unit may be operated with equal efficiency, either in combination with or independently of the other. Size 8 x 10½ in. Pp. 36.



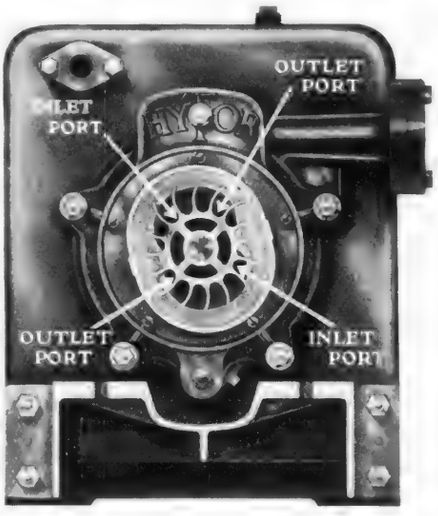
CONSTRUCTION OF WEBSTER FEED WATER HEATER.

VALVE WORLD for March, 1923, the monthly periodical of Crane Co., Chicago, continues the publication of the

Crane Business Survey, giving a report of business conditions throughout the country at the end of February. This number also contains, among other things, an interesting article on the manufacture of steel for castings by L. W. Spring, the company's chief chemist and metallurgist.

JENNINGS HYTOR VACUUM HEATING PUMP, SIZE M, ELECTRIC-MOTOR DRIVEN, is a new design brought out by the Nash Engineering Co., South Norwalk, Conn., and described in the company's bulletin No. 25. It is designed to maintain a vacuum and return all condensation in connection with vacuum return-line heating systems. Special attention is called to its small size which, it is stated, has been achieved without any loss in the advantages possessed by the company's larger equipment. The reduced price at which this unit can be manufactured permits its use in small installations where heretofore the high cost of the pump has made such a system impractical. As will be noted from the illustration of the complete unit, there are no piping connections to be made between the pump and its receiver. It is thus necessary only to connect the return main, the water discharge and the air discharge. Companion flanges are provided for these three necessary connections. The Size M unit embodies the distinguishing feature of the Jennings Hytor return-line pumps, in that the positive displacement vacuum pump exhausts air only, while a centrifugal element handles only the condensate. In this way, it is stated, a high efficiency is obtained. The bulletin includes illustrations of the piping arangements for these units and there is also given a typical form of specification. Size 7½ x 10¾ in. Pp. 6.

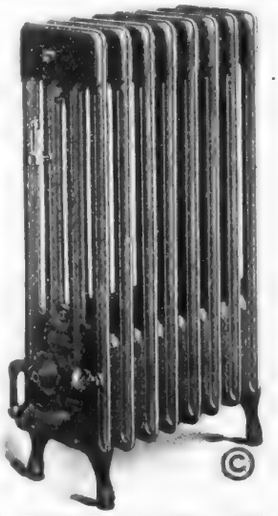
RELIANCE ELECTRIC PRESSURELESS LOW-WATER ALARMS for heating plants, are forcefully presented in a circular issued by the Reliance Gauge Column Co., Cleveland, O. One of the illustrations shows a cut-away section of a building with the alarm connected to a gong in the janitor's room on the top floor. Two types of this device are illustrated, one for the ordinary heating plant, replacing the plain column with a low-water alarm and the other (Reliance Junior) for use on small boilers where the water gauges and gauge cocks are tapped in the boiler shell. In the ordinary heating boiler for operating pressures of 15 lbs. and under, a Reliance electric pressureless alarm is used. for higher pressures, either a whistle or Reliance electric alarm, or both, are used. The appliance is described as a sure protection against burnt-out boilers. The alarm operates only when the water level falls below a certain danger point. The float, attacked by a brass rod to the lever above, presses upward and holds the electric switch open as long as the water is above this point. When the water level falls, the float lowers the lever, closing the circuit and operating the alarm. The signal continues until the water level rises again out of danger. This signal may be a light, bell or buzzer, as desired, at any distance from the boiler.



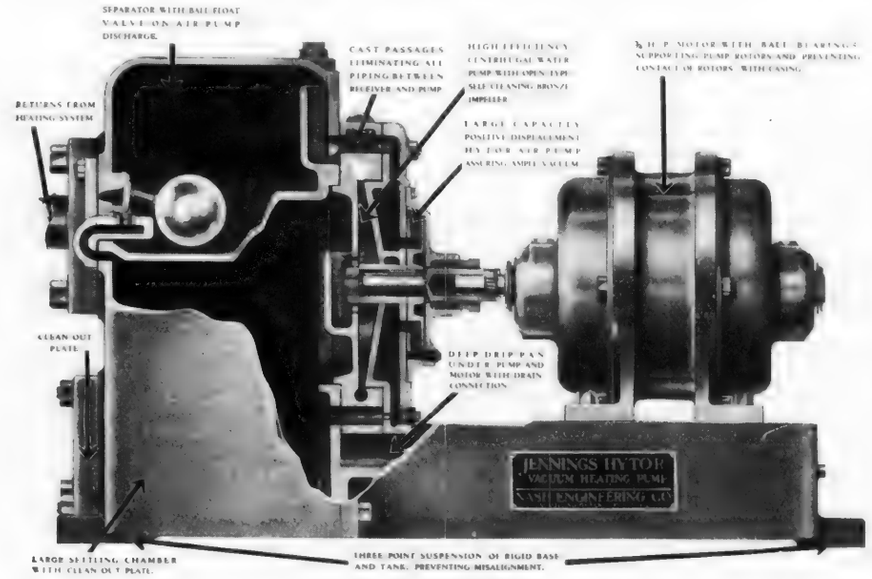
CROSS SECTION OF POSITIVE DISPLACEMENT AIR UNIT, SHOWING PRINCIPLE OF OPERATION.

BRISTOL'S RECORDING GAUGES for pressure and vacuum, are comprehensively discussed in a new catalogue (No. 1006) received from the Bristol Co., Waterbury, Conn. The catalogue gives impressive evidence of the extent of the company's line. All ranges from full vacuum to 12,000 lbs. pressure, it is stated, can be taken care of by Bristol's recording pressure and vacuum gauges. In addition a great variety of charts which are listed and shown in the catalogue adapt the gauges to practically every application where pressure of liquids, gases, steam or air are required to be measured. Special attention is directed by the manufacturer to the Bristol long-distance electric transmitting system by which records of pressure and liquid level can be transmitted over distances of even several miles. Illustrations are included of each type of instrument and the mechanism of many is shown in detail. Size 8 x 10½ in. Pp. 84, (punched for binding).

1922-1923 HANDBOOK OF THE CLOW GASTEAM HEATING SYSTEM has been published by James B. Clow & Sons, Chicago. The handbook is replete with information, with rules, for installing Gasteam radiators by themselves and in combination with standard steam and water heating systems. There are also several pages of general data giving rules for figuring radiation, together with tables of comparative costs of installation and operation. The handbook features the construction of the Clow Gasteam radiator which is composed of cast-iron sections fitted together with malleable slip nipples. The sections are made so that the upper part forms a radiating surface of two, three and four columns. Directly beneath the radiating surface is a water chamber made to hold a body of water 1 in. deep. Beneath and an integral part of the section is a chamber for holding a Bunsen gas burner. Due to the large radiation surface of the Clow form of construction, a large volume of air may be heated to a low temperature and circulated in the room at a low velocity. The gas supply to the burner is controlled by an automatic regulator so that when the steam pressure rises to 5 lbs., the volume of gas is automatically reduced to maintain that pressure. Size 4½ x 9 in. Pp. 28.



LATEST TYPE OF CLOW GASTEAM RADIATOR.


SEPARATOR WITH BALL FLOAT VALVE ON AIR PUMP DISCHARGE
CAST PASSAGES ELIMINATING ALL PIPING BETWEEN RECEIVER AND PUMP
HIGH EFFICIENCY CENTRIFUGAL WATER PUMP WITH OPEN TYPE SELF CLEANING BRONZE IMPELLER
RETURNS FROM HEATING SYSTEM
LARGE CAPACITY POSITIVE DISPLACEMENT HYTOR AIR PUMP ASSURING AMPLE VACUUM
CLEAN-OUT PLATE
DEEP DRIP PAN UNDER PUMP AND MOTOR WITH DRAIN CONNECTION
JENNINGS HYTOR VACUUM HEATING PUMP
NASH ENGINEERING CO.
LARGE SETTLING CHAMBER WITH CLEAN OUT PLATE
THREE POINT SUSPENSION OF RIGID BASE AND TANK, PREVENTING MISALIGNMENT.

SECTION OF JENNINGS HYTOR PUMP PARALLEL WITH SHAFT SHOWING INDEPENDENT AIR ROTOR AND WATER IMPELLER.

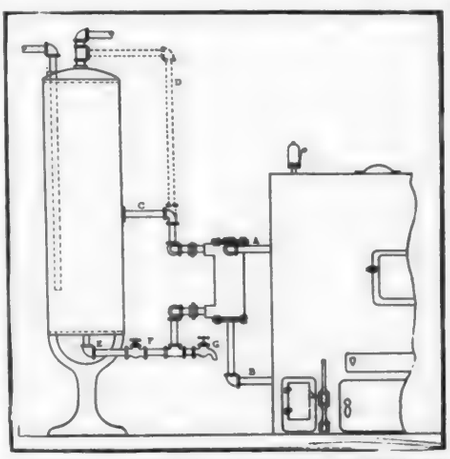
HOLMBERG HEATING SPECIALTIES, manufactured by the Holmberg Steam Trap Co., Lindborg, Kan., are presented in a new catalogue featuring the Holmberg quick-vent air and vacuum valve, vacuum-vapor vent, vacuum-vapor-steam trap and eliminator and vacuum seal, all of which were designed by John A. Holmberg. Typical installations are shown of a pressure-vacuum-vapor gravity system and a pressure-vacuum-vapor sub-drain system, using these specialties. Numerous piping details are also illustrated. Size 4 x 6½ in. Pp. 22.

PRUDENTIAL SMOKELESS DOWN-DRAFT BOILERS, manufactured by the Prudential Heater Co., Louisville, Ky., for which the Laib Co., Louisville, acts as distributor, are shown in a concisely arranged folder containing the necessary data covering both steam and water types in 17 sizes. This is the boiler designed by A. G. Cripps which has long held a distinctive place in the field as one of the original down-draft low-pressure types.

PULLS THE PROBLEM THROUGH THE ROOF is the way the Allen Air Turbine Co., Deroit, Mich., describes the action of the Allen air turbine in a circular devoted to this ventilator. Air displacement figures at 4 and 8 miles per hour wind velocity are included for eleven sizes, from 8 to 48 in. diameter. The displacement figures, ranging from 17,300 to 350,000 cu. ft. at a 4-mile velocity and from 21,600 to 473,000 cu. ft. at an 8-mile velocity, are guaranteed by the company.

REED AIR FILTER and the necessity for cleaning air and gases, are brought to the attention of the trade in a bulletin (No. 106) issued by the William Reed Engineering Co., Louisville, Ky. The filter itself is described as an all-metal filter operating with inexpensive chemicals. The bulletin explains how the expanding effects of industry, together with the increased use of soft coal and rather general contamination of the air by objectionable and injurious gases have made it evident that outdoor air is not necessarily clean air. The Reed system of air filtration is then discussed, being the result of exhaustive laboratory tests and three years of successful operation. The filter is described as operating fundamentally on the same principle as the human nostril. Air in passing through the filter impinges on a filter medium saturated with simple chemicals which act to leach out the dirt and deposit it on the filter body. As the successive layers of dirt are deposited and bound on the filtering medium additional adhesion is supplied by capillary action, being withdrawn from the minute droplets or reservoirs of the liquid held at the intersections of the media and in this way serving to bind and keep the entire system moist for considerable periods. It is pointed out that even if the individual fibres of the filter media collect a very thick deposit of dirt, the relative space between the fibres will not be appreciably decreased, an important feature in keeping the resistance down. Another point mentioned by the manufacturer is that in passing through the filter the air changes in direction from 11 to 18 times, each change in direction being caused by an impingement of the air on the chemically-coated filtering media. This, it is stated, serves greatly to increase the filter's efficiency in dust removal. The company has issued six catalogues on the Reed air filter. In addition to the one here reviewed, other catalogues take up tests, specifications and data (No. 107), general ventilation work (No. 108), and drying operations and bacteria control (No. 111). Size 8½ x 11 in. Pp. 4 (punched for binding).

HOT WATER FROM HEAT YOU HAVE ALREADY PAID FOR is the way the Thermal Appliance Co., New York, describes the usefulness of the Taco water heater, in its newly-issued circular matter. Applications of the heater are shown in connection with steam and vapor heating plants for supplying hot water for domestic service, using the boiling water in the boiler as the heating medium or the direct heat from the fire. The accompanying illustration shows the method of attaching the Domestic Taco to a heating boiler with connections from the heater to a hot water storage tank. Capacity tables are given for the Domestic Taco, the Flo-Line Taco and the Universal Taco. Size 8½ x 11 in. Pp. 4.



TYPICAL INSTALLATION OF DOMESTIC TACO WATER HEATER.

MONARCH UP-DRAFT SMOKELESS BOILERS, designed to burn soft coal, hard coal or coke, are brought to the attention of the trade in a handy folder issued by the Wm. H. Page Boiler Co., New York, in which the principle of operation of the boiler is very clearly illustrated. Ratings and dimensions are given for both steam and water series in 28 sizes, each, giving a range in capacity from 850 to 11,400 sq. ft. in the steam series and from 1400 to 19,000 sq. ft. in the water series. The point is emphasized that the boilers are built in comformity with the A. S. M. E. Boiler Code, while the ratings are made in accordance with the standard formula of the A. S. H. & V. E. The Monarch up-draft smokeless boiler, being of the single-grate type, has an air inductor through which air from both sides of the boiler is admitted to the secondary combustion chamber. The fact that the boiler is adaptable for burning hard coal, coke, wood, oil or gas, in addition to soft coal, is mentioned as being especially advantageous in times of fuel shortage. Size 8 x 11 in. Pp. 4.

WOODSOME SYSTEM OF STEAM CIRCULATION AND REGENERATION, as applied to paper machines, is an interesting method which has been developed by John O. Woodsome & Co., Chicago, Ill., and which is the subject of two publications received from the company. The Woodsome system consists mainly of a new piping arrangement and a new use of standard steam specialties designed to better the quality of the paper produced and to give it a uniform moisture content, at the same time drying at an increased rate of speed and at a decreased rate of steam consumption. The Woodsome system, it is stated, fully recognises that graduated temperatures on a drying machine are essential. Two important factors in bringing about these results, it is added, are the use of graduated temperatures on the machine and the instant and complete removal of all air and condensate from the dryers. Contrary to usual practice, which is to maintain a pressure in all dryers sufficient to force condensate and air through the syphon pipe and into a return header, the Woodsome system is provided with steam exhausters or ejectors, located on the return from each individual dryer, by the use of which condensate air and used steam are drawn from the dryers. Condensate, on passing through the ejectors, is reheated and regenerated into steam by the steam supplied to operate the ejectors, and is discharged back into a single header for re-use in subsequent dryers, the one-pipe header functioning both as a supply and as a return header. Test data are included indicating the economy obtained by the use of regenerated steam in subsequent dryers. The details of operation are discussed at length in the bulletin, together with a double-page drawing of a typical installation of the Woodsome system. Among the specialties used are a piston-operated valve and a Type M auxiliary valve of the Klipfel Mfg. Company's make, Chicago. Size 8½ x 11 in. Pp. 12.

ARE YOU TROUBLED BY DIRT AND DUST, asks the Midwest Steel & Supply Co., New York, in a newly-issued folder and then gives the answer by illustrating and describing the Midwest unit air filter, which is characterized as "the air washer without moving parts or water." The filter is described as being based on the principle of passing air through layers of small, irregularly-placed metal cylinders (filter bodies) the surfaces of which are covered with a coating of a viscose fluid (Midwest viscosine). Dust-laden air encountering these layers of filter bodies is split up into innumerable subcurrents which wind their way through the layers in ever-changing directions, depositing much of the dust contents in the many corners and crevices. The viscose coating on the filter bodies is designed to catch the balance of the dust. The fact that the company has had eight years of successful operation with over

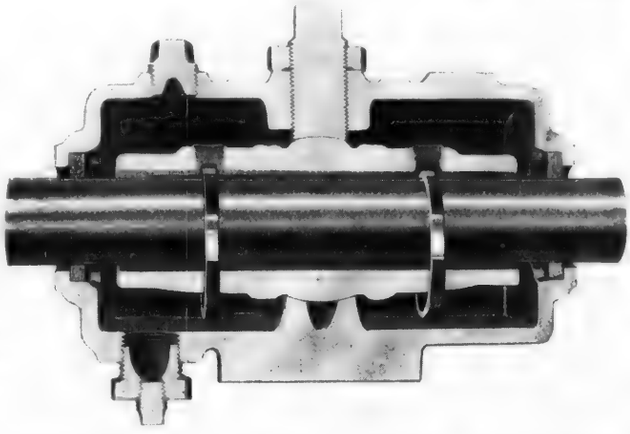
2,000 installations of these units, with a total capacity of 40,000,000 cu. ft. of air per minute, is mentioned as evidence of the filter's usefulness.

JOHNS-MANVILLE STEAM TRAP, showing the latest design of this unique device, is the subject of a newly-issued catalogue issued by Johns-Manville, Inc., New York. The simplicity of this trap, with its hollow, seamless ball, taking the place of levers, buckets, thermostats, cotterpins, etc., is well known. The new catalogue shows the operating features very clearly and is accompanied by dimensions and list prices. Space is also devoted to the Johns-Manville Junior steam trap for pressures up to 100 lbs. and to Johns-Manville radiator traps, for steam pressures up to 100 lbs. Size 3⅓ x 6-in. Pp. 8.

ADSCO WATER HEATER, described as "the little heater with the big capacity," for use with live steam, exhaust steam, vapor or hot water as the heating medium, is announced by the American District Steam Co., North Tonawanda, N. Y., in newly-issued bulletins. The heater is arranged to be easily attached to any steam or vapor heating plant either above or below the water-line, thus saving the cost of operation of a gas water heater during the time that the heating plant is in use. The heating element consists of ½-in. B. & S. gauge copper U-tubes, containing 2 sq. ft. of surface, expanded into a header. The capacity when installed with connection below water-line of steam or vapor boiler is 60 gal. per hour; when connected with live steam as heating medium, 100 gal. per hour.

Construction of Clarage Standard Fan Bearings.

A very clear idea is given in the accompanying illustration of the construction of the standard bearing used on all sizes of Clarage fans. They are described in a new catalogue issued by the manufacturer, the Clarage Fan Co., Kalamazoo, Mich., as the best ring-oiling, babbitted bearing obtainable. It will be noticed that they have an unusually large bearing surface. They are also self-aligning in all planes. Felt washers are attached at either end of the outer case to keep out the dirt and to keep in the oil.



CONSTRUCTION OF CLARAGE STANDARD FAN BEARING.

Fluctuations in Prices of Radiators from 1903 to Date.

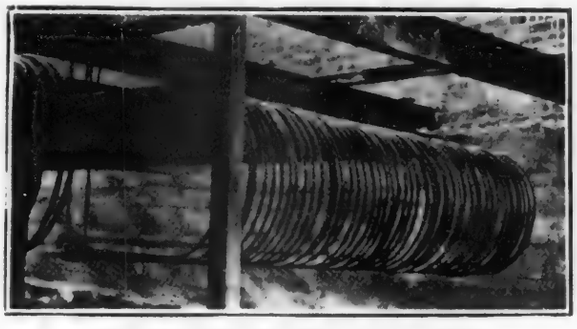
The accompanying chart, compiled by E. F. Capron, of the Lewis & Capron Co., Chicago, Ill., shows the fluctuations in the prices of cast-iron direct radiators from 1903 to the present time, in Chicago. The extent of the present rising market makes a striking feature of the curve, as does also its high point as compared with any pre-war period.

Improved Dry Kiln Piping Installation.

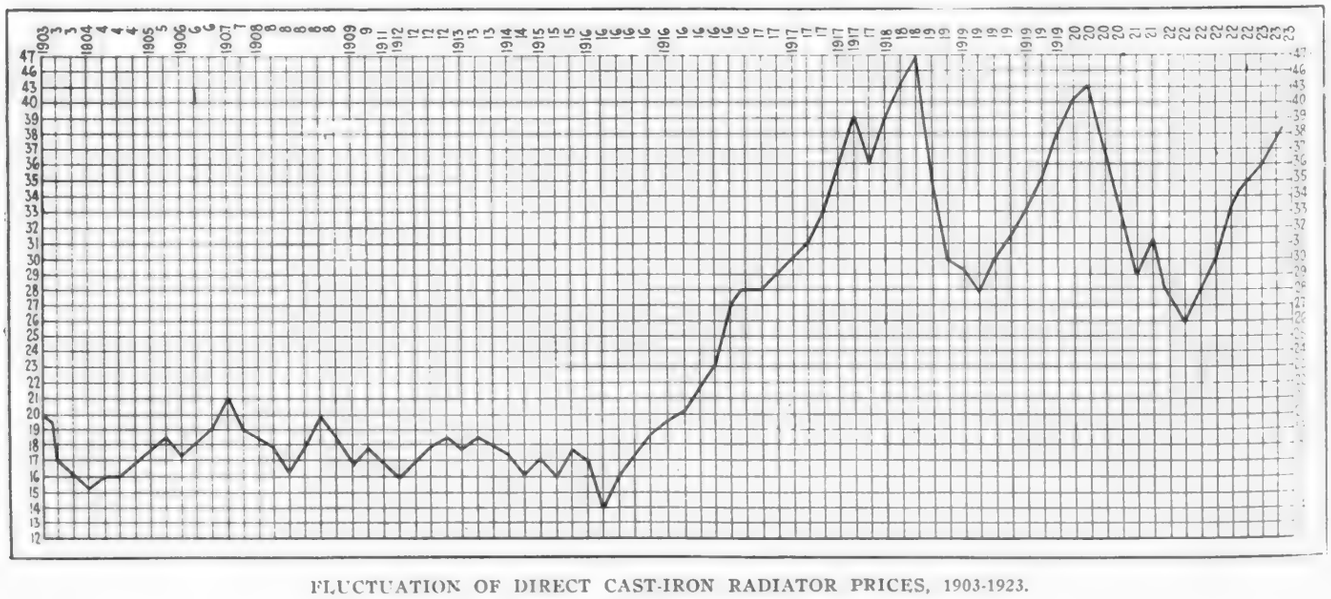
In order to eliminate the breakage due to expansion in lumber dry kiln piping, the engineering department of the New Orleans branch of Crane Company has designed a new method of installation which is illustrated herewith. The details of the design are described by H. T. Fryant in the *Valve World* for March, 1923, published by Crane Company.

At the front or inlet end is placed the first or No. 1 header, four feet from the front wall, and four feet under the track beams. This header is made of 5-in. extra heavy pipe, drilled and tapped ⅜-in. on 2½-in. centers, leaving blank the space taken up by the center supports. At one-third the length of the kiln back from the front end is placed header No. 2, and two-thirds back, header No. 3.

These headers are all alike and are full width of the kiln and supported by U-bolts attached to the track beams. U-bends are made of ⅜-in. extra-heavy pipe and attached to these headers by an extra-heavy nipple and right and left coupling. To the other end of the U-bends is attached the 1-in. regular dry kiln pipe by the use of a 1 in. by ⅜ in. extra-heavy reducer, extra-heavy nipple,



NEW METHOD OF DRY KILN PIPING



FLUCTUATION OF DIRECT CAST-IRON RADIATOR PRICES, 1903-1923.

use an extra-heavy right and left coupling.

Steam is admitted to these headers through an opening left in the end, and a small trap on the other end removes all condensation that might collect. Steam then flows up through the U-bend into the 1-in. pipes, each 1-in.-pipe having its own independent U-bends to handle the expansion which takes place whenever the pipe becomes hot. The rear or drainage headers are the same as the front or feed headers, except that they are drilled and tapped for 1-in. pipe. They, like the front headers, are laid crosswise of the kiln and supported by U-bolts from the track beams and laid one above the other with a 1-in. spacing block of cast-iron between them. These headers are drained from the ends into a common drain pipe, which is in turn connected to the main steam trap.

It will be noted from the foregoing that the use of an ell is entirely eliminated and that a right angle strain on a thread is impossible, also that the expansion of each run of pipe is taken care of independently. All that is necessary to adopt this system in any kiln is the clearance between the ground and the under side of the track support, which must be at least 4 feet. It should be understood that it is not necessary to use three runs of pipe, as it depends altogether on the steam pressure and the desired temperature as to the amount of pipe in the kiln.

The same system can be used where only one layer is required by the use of one front and one rear header. If it is desired to have all the layers of pipe run the full length of the kiln, the inlet headers are then placed near the front, one slightly below the other and about 12 in. apart, horizontally. All the layers of pipe are securely supported on 1½-in. extra-heavy pipe placed crosswise of the kiln. These supporting pipes are carried on U-bolts attached to the cross-beam, and the pipes carrying the layers under the top layer are carried on S-hooks attached to the cross pipe over it, which makes a very strong and substantial construction.

The installation of piping with this system becomes a very simple process. After side walls are up above the track supports, the rear and front headers are placed in their hangers, and two of the expansion bends, one at each end of the front header, are connected up to determine where the ends of the heating pipes are to be cut off. The 1-in. heating pipes are then screwed into the rear headers and continued all across the kiln, screwing enough together to bring their ends beyond a line established by the ends of the two expansion bends.

After all pipes in the different layers (if more than one layer) have been screwed together a line is stretched across at a point where they are to be cut and a mark made on all pipes at once. They are then cut off with a regular pipe cutter, or burned off with the torch. It is now an easy matter to unscrew the last pieces, running on the thread, and placing thereon the ⅜-in. by 1-in. reducers, screwing them back into their respective places and make on the expansion bends with the right and left extra-heavy nipple and coupling.

It will be noted that it is necessary to cut only one piece of pipe for each run. All the work of installing can be done by common labor in less than one-third the time necessary with other systems using the best of steam fitters.

The steam entering the 1-in. heating pipes through the ⅜-in. expansion tubes is practically dry, increasing to a large extent the efficiency of the kiln. No expansion strains are placed on any joint because of the tendency of the expansion tube to straighten out, placing a pull on the 1-in. heating pipe, keeping it straight and in line.

Ventilating Fans for "Afternoon Fatigue."

A publicity drive conducted by the American Blower Co., Detroit, Mich., with the slogan of "Cutting Out the Afternoon Fatigue" features the ABC line of Ventura type ventilating fans. Special emphasis is laid on the ease with which they may be installed. An adjustable fan frame is provided, designed especially for supporting the 2⅓ reversible Ventura fan in position in the small office window or in the home kitchen where it is equally adaptable. The entire unit is furnished complete, including the 2½ Ventura fan, supporting frame, adjustable for windows 24 in. to 34 in. wide, with handles for raising or lowering the upper window sash, and including electric cord for attaching to ordinary lamp socket. The price of the complete unit is $52.50.

Death of Harry L. Williams.

Harry L. Williams, manager of the Milwaukee branch of the American Warming and Ventilating Co., died in York, Pa., February 15. Those who attended the Washington meeting of the American Society of Heating and Ventilating Engineers will recall the prominent part he took in the discussion of furnace heating, on the last day of the meeting. He remained in Washington after the meeting to rest, as he was not feeling well at the time and later went to York to recuperate. Mr. Williams was 67 years old. He had long been connected with the industry, first entering the heating and ventilating field through a connection with the Peck-Williamson Co., of Cincinnati. Later he became Pittsburgh manager for the American Warming & Ventilating Company and was at one time president of the company. Mr. Williams had taken an active part in the formation of the Wisconsin Chapter of the A. S. H. & V. E., which was recently granted a charter by the society. He had been a member of the A. S. H. & V. E. since 1911.

David Cochrane, inventor, who designed and built the first open feed water heater, died January 24. Born in Scotland, in 1850, Mr. Cochrane came to the United States in 1879 and entered the employ of Ferris & Miles. A little later he became connected with the Harrison Safety Boiler Works, where in 1883 he designed and brought out his open heater, the first built of cast-iron plates to avoid corrosion. Gifted with usual capacity for simplifying construction, he was frequently called into consultation concerning the design of steam plants. He was also the first to design a successful oil separator, a heater and receiver, and numerous appliances now in common use. Due to his efforts greater attention was given a more efficient utilization of exhaust steam for heating buildings and for heating and purifying water for feeding boilers and for industrial use.

Moritz Berla, who retired from the plumbing business in 1910, died at his home in Newark, N. J. February 17. He was 94 years old and one of the few remaining charter members of the Master Plumbers' Association of Newark. He came to the United states from Bocholt, Westphalia, Germany in 1854 and for a time was employed in New York. Moving to Newark he was employed for nearly eleven years in the plumbing shop of James Hague. He then opened his own business which he conducted until his retirement.

William S. Ransom, whose death in New York on January 21, was noted in last month's issue, had been identified with the heating, steam and plumbing supply industries for more than fifty years. He was born in New York City and attended the public schools in this city. At the age of 18 years, he was employed as a salesman for Hunter & Feller, and a little later, when John Simmons, also with that firm, started in business, young Ransom went with him as a salesman. After a few years Mr. Ransom went into the supply business on his own account under the firm name of Ransom & Wells, where for a number of years he did a large business. Disposing of his interest in the firm, he moved to Duluth as head salesman for Kellogg & Cameron, traveling extensively in the United States and Europe. Returning east in 1912 he became manager of the vacuum heating pumps and condensation pump outfit department of Beach-Russ Company, remaining there until 1920 when he became eastern New York representative of Trane Company.

Joel Cadbury, senior member of Haynes, Johnes & Cadbury Co., Philadelphia, died January 25. He had been connected with the heating and plumbing industries since 1867. He was survived but a little over a day by his widow and they were burried together.

Theodore S. Todd, president of the Leskole Air Valve Co., Inc., New York, died at his home in Brooklyn, February 11. Mr. Todd was 57 years old. He had lately returned from Bermuda and soon thereafter contracted the grippe from which he died.

General Outlook Satisfactory

Increase in Cost of Many Raw Materials and Higher Wages Indicate Rising Manufacturing Cost.

The month of March has vindicated the promise of February. Business is getting generally more active in all its branches and there are distinct indications for a further improvement during the next few months. This fact is borne out not only by the more usual indicators, by which is measured market strength, but also by actual experience. There has been noticed during the last month a considerable increase in selling activity. The turnover of department stores is larger and the reports of the dry goods houses prepare for a good early summer trade.

But while renewed prosperity is at the door, even if it has not actually arrived, yet there are still certain features of the situation that require the attention of the industrial producer. Rising cost of many raw materials has been accompanied by a similar increase in the cost of labor, with the result that manufacturing cost, after declining for a while, is now taking a new upward turn. This is bound to give concern to those engaged in industrial production. Manufacturers will do well to keep close watch upon their production accounts, especially as the margin of profit enjoyed by most industries has been exceedingly narrow during the last year. It has fallen in many cases much below the profits required for healthy industrial operation.

There is nothing more dangerous to any factory than that steady and often hardly-realized drain upon its economic strength that is caused by slight, but recurring, increases in the cost of one or the other principal raw material. This drain has been especially noticeable during the last few months, and the response of retail prices to the steady upward movement of many of the leading industrial raw materials has been very weak indeed.

The situation has been complicated by a peculiar disinclination to spend money on the side of the general public. Wages have been on the upgrade for several months and employment is increasing. True, the cost of living is also rising again, but the wage earning classes hold still a comfortable surplus that might well be spent upon purchases and which has been spent pretty freely around Christmas. Savings banks are reporting an increase in deposits, and the return of confidence in the soundness of the nation's business combined with the prospect of regular work, no doubt, will soon release part of the savings holdings for the purpose of purchases of all kinds.

The rise in the price of several raw materials experienced some weeks ago has given cause to caution against a recurrence of monetary inflation. Inflation happily seems to have been avoided. No "boom" conditions being visible, there is every hope that the present forward movement will develop considerable natural strength, carrying the markets to records, which, while possibly not exceeding those of the best years of the war, certainly may equal them.

The present is a situation where optimism is required by all those helping turn the nation's wheels. There is a good chance for all. But the recovery is still too young for it to stand such sudden increases in the cost of overhead as may easily be caused by individual waste, careless financing or frequent industrial disputes. These, therefore, must be avoided under any circumstances.

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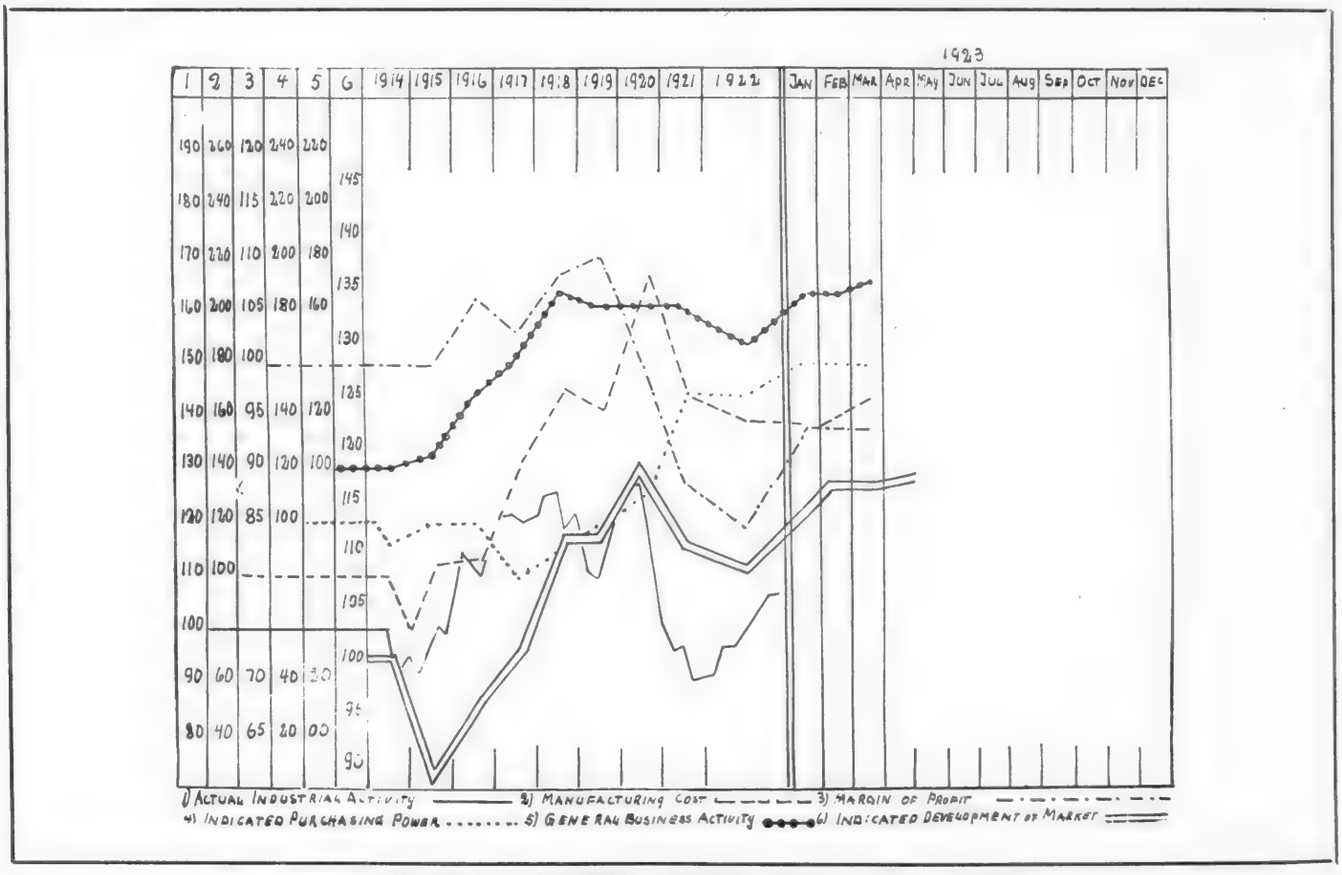
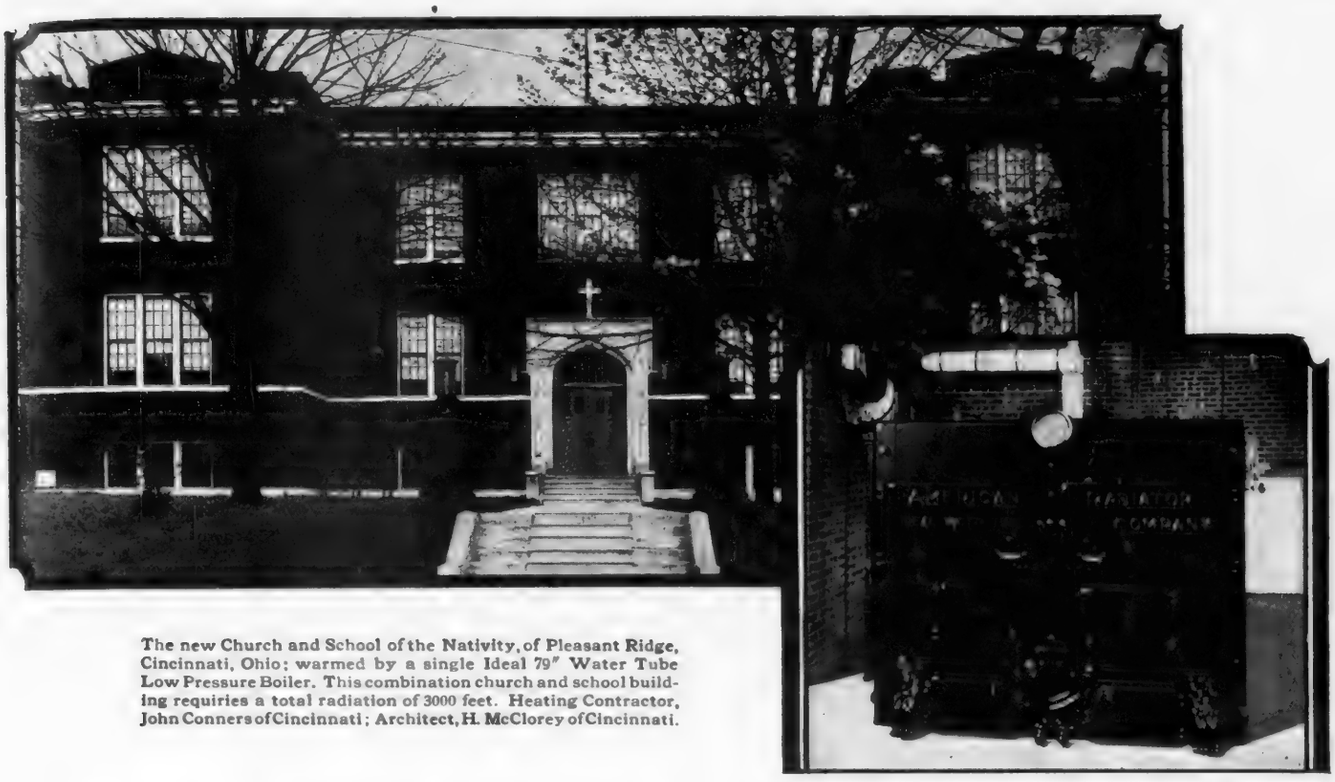

1923
1914 1915 1916 1917 1918 1919 1920 1921 1922
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1) ACTUAL INDUSTRIAL ACTIVITY
2) MANUFACTURING COST
3) MARGIN OF PROFIT
4) INDICATED PURCHASING POWER
5) GENERAL BUSINESS ACTIVITY
6) INDICATED DEVELOPMENT OF MARKET

ANALYSIS OF BUSINESS CONDITIONS AT END OF MARCH.

Business Chances.

Elkhart, Ind.—The city council has voted to issue bonds in the sum of $145,000 for the erection of a new high school auditorium and gymnasium, and for $60,000 to be used in moving and relocating the high school heating plant.



The new Church and School of the Nativity, of Pleasant Ridge, Cincinnati, Ohio; warmed by a single Ideal 79″ Water Tube Low Pressure Boiler. This combination church and school building requiries a total radiation of 3000 feet. Heating Contractor, John Conners of Cincinnati; Architect, H. McClorey of Cincinnati.

For Churches and Schools— Low Pressure Boilers

LOW PRESSURE SECTIONAL BOILERS are rapidly coming into their own for heavy-duty work in large buildings. Here is another successful installation in the Church and School of the Nativity, Pleasant Ridge, Cincinnati, Ohio.

The following letter from the Pastor, Rev. J. H. Burke, written us after the first winter's operation, tells a story typical of scores of churches and other large buildings where the IDEAL 79″ Boiler is in use:

"The operation of your IDEAL 79″ Boiler and AMERICAN Radiators in our new school and church building is entirely satisfactory. The fuel consumption is low and the boiler requires very little attention.

"One of its great advantages is that our Janitor, in addition to his regular duties, takes care of firing the boiler without having had previously any practical experience along that line."

IDEAL 79″ Water Tube Boilers are doing heavy duty work in large schools, churches, hospitals, banks, theatres, apartments, and office buildings. In single units or in batteries, they are carrying efficiently and economically, radiation loads ranging from 1,000 to 30,000 feet and more—and often furnishing steam for domestic hot-water as well.

The many interesting points of construction of the IDEAL 79″ Water Tube Boiler have been described, illustrated and charted in an attractive booklet which every Architect and Heating Engineer should have. Your name on your letterhead, sent to either address below, will bring your copy to you.

AMERICAN RADIATOR COMPANY

IDEAL Boilers and AMERICAN Radiators for every heating need

104 West 42nd Street, Dept. T-52
NEW YORK

AMERICAN RADIATORS | IDEAL BOILERS

816 So. Michigan Ave., Dept. T-52
CHICAGO

THE HEATING ND V. A NG MAGAZI E 1123 BROADWAY, N. Y CITY

TA R VENTI .TING DUCTS.

Superficial Area an gh of Galvanized Sheet Iron Rectangular Ducts.

WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT

Wt. & Gauge	27# #26	22# #24	17# #22	15# #20	12# #18	10# #16
#/Per Lin Ft.	1.367	1.733	2.167	2.700	3.467	4.333

CROSS SECTIONAL DIMENSIONS OF DUCTS IN INCHES	#/Per Lin Ft.	27# #26 Gauge	22# #24 Gauge	17# #22 Gauge	15# #20 Gauge	12# #18 Gauge	10# #16 Gauge
1 × 1	3.83	10.80	13.65	17.05	21.30	27.65	38.35
1 × 2	4.00	11.25	14.20	17.75	22.20	28.80	40.00
1 × 3	4.17	11.70	14.80	18.45	23.10	30.00	41.65
1 × 4	4.33	12.15	15.35	19.15	24.00	31.15	43.30
1 × 5	4.50	12.60	15.95	19.85	24.90	32.30	44.95
1 × 6	4.67	13.05	16.50	20.55	25.80	33.45	46.60
1 × 7	4.83	13.50	17.05	21.25	26.70	34.60	48.25
1 × 8	5.00	13.95	17.65	21.95	27.60	35.75	49.90
1 × 9	5.17	14.40	18.20	22.65	28.50	36.90	51.55
1 × 10	5.33	14.85	18.75	23.35	29.40	38.05	53.20
1 × 11	5.50	15.30	19.35	24.05	30.30	39.20	54.85
1 × 12	5.67	15.75	19.90	24.75	31.20	40.35	56.50
1 × 13	5.83	16.20	20.45	25.45	32.10	41.50	58.15
1 × 14	6.00	16.65	21.05	26.15	33.00	42.65	59.80
1 × 15	6.17	17.10	21.60	26.85	33.90	43.80	61.45
1 × 16	6.33	17.55	22.15	27.55	34.80	44.95	63.10
1 × 17	6.50	18.00	22.75	28.25	35.70	46.10	64.75
1 × 18	6.67	18.45	23.30	28.95	36.60	47.25	66.40
1 × 19	6.83	18.90	23.85	29.65	37.50	48.40	68.05
1 × 20	7.00	19.35	24.45	30.40	38.40	49.55	69.70
2 × 2	4.33	12.00	15.15	18.85	23.80	30.75	43.20
2 × 3	4.67	12.95	16.35	20.35	25.70	33.20	46.70
2 × 4	5.00	13.85	17.50	21.75	27.50	35.50	50.00
2 × 5	5.33	14.80	18.70	23.25	29.40	37.95	53.40
2 × 6	5.67	15.75	19.90	24.75	31.20	40.30	56.70
2 × 7	6.00	16.65	21.05	26.15	33.00	42.65	59.80
2 × 8	6.33	17.55	22.15	27.55	34.80	44.95	63.10
2 × 9	6.67	18.45	23.30	28.95	36.60	47.25	66.40
2 × 10	7.00	19.35	24.45	30.40	38.40	49.55	69.70
2 × 11	7.33	20.25	25.60	31.80	40.20	51.85	73.00
2 × 12	7.67	21.15	26.70	33.20	42.00	54.20	76.30
2 × 13	8.00	22.05	27.85	34.60	43.80	56.50	79.60
2 × 14	8.33	23.00	29.05	36.10	45.60	58.85	82.80
2 × 15	8.67	23.90	30.20	37.50	47.40	61.15	86.10
2 × 16	9.00	24.80	31.30	38.90	49.20	63.50	89.40
2 × 17	9.33	25.75	32.50	40.40	51.00	65.80	92.70
2 × 18	9.67	26.65	33.65	41.80	52.80	68.15	96.00
2 × 19	10.00	27.55	34.80	43.20	54.60	70.45	99.20
2 × 20	10.33	28.50	35.95	44.70	56.40	72.80	102.50
3 × 3	5.00	13.80	17.45	21.70	27.40	35.55	49.80
3 × 4	5.33	14.75	18.60	23.10	29.30	37.80	53.20
3 × 5	5.67	15.70	19.80	24.60	31.10	40.15	56.50
3 × 6	6.00	16.60	20.95	26.00	32.90	42.50	59.80
3 × 7	6.33	17.50	22.10	27.40	34.70	44.80	63.00
3 × 8	6.67	18.40	23.25	28.80	36.50	47.10	66.30
3 × 9	7.00	19.30	24.40	30.30	38.30	49.40	69.60
3 × 10	7.33	20.25	25.55	31.70	40.10	51.75	72.80
3 × 11	7.67	21.15	26.70	33.10	41.90	54.05	76.10
3 × 12	8.00	22.05	27.80	34.50	43.70	56.40	79.40
3 × 13	8.33	23.00	29.00	36.00	45.50	58.70	82.60
3 × 14	8.67	23.90	30.15	37.40	47.30	61.05	85.90
3 × 15	9.00	24.80	31.25	38.80	49.10	63.35	89.20
3 × 16	9.33	25.75	32.45	40.30	50.90	65.70	92.50
3 × 17	9.67	26.65	33.60	41.70	52.70	68.00	95.70
3 × 18	10.00	27.55	34.75	43.10	54.50	70.35	99.00
3 × 19	10.33	28.50	35.90	44.60	56.30	72.65	102.30
3 × 20	10.67	29.40	37.05	46.00	58.10	75.00	105.60
4 × 4	5.67	15.60	19.70	24.50	30.90	40.00	56.30
4 × 5	6.00	16.55	20.85	25.90	32.70	42.35	59.60
4 × 6	6.33	17.45	22.00	27.30	34.50	44.65	62.90
4 × 7	6.67	18.35	23.15	28.70	36.30	47.00	66.20
4 × 8	7.00	19.30	24.30	30.20	38.10	49.30	69.40
4 × 9	7.33	20.20	25.45	31.60	39.90	51.65	72.70
4 × 10	7.67	21.10	26.60	33.00	41.70	53.95	76.00
4 × 11	8.00	22.05	27.75	34.40	43.50	56.30	79.30
4 × 12	8.33	22.95	28.90	35.80	45.30	58.60	82.50
4 × 13	8.67	23.90	30.05	37.30	47.10	60.95	85.80
4 × 14	9.00	24.80	31.20	38.70	48.90	63.25	89.10
4 × 15	9.33	25.70	32.35	40.10	50.70	65.60	92.40
4 × 16	9.67	26.65	33.50	41.50	52.50	67.90	95.60
4 × 17	10.00	27.55	34.65	42.90	54.30	70.25	98.90
4 × 18	10.33	28.45	35.80	44.40	56.10	72.60	102.20
4 × 19	10.67	29.40	36.95	45.80	57.90	74.90	105.50
4 × 20	11.00	30.30	38.10	47.20	59.70	77.25	108.80
5 × 5	6.33	17.40	21.90	27.15	34.30	44.40	62.50
5 × 6	6.67	18.30	23.05	28.55	36.10	46.70	65.80
5 × 7	7.00	19.25	24.20	30.00	37.90	49.05	69.10
5 × 8	7.33	20.15	25.35	31.40	39.70	51.40	72.30
5 × 9	7.67	21.05	26.50	32.80	41.50	53.70	75.60
5 × 10	8.00	22.00	27.65	34.20	43.30	56.05	78.90
5 × 11	8.33	22.90	28.80	35.70	45.10	58.40	82.10
5 × 12	8.67	23.80	29.95	37.10	46.90	60.70	85.40
5 × 13	9.00	24.75	31.10	38.50	48.70	63.05	88.70
5 × 14	9.33	25.65	32.25	39.90	50.50	65.40	92.00
5 × 15	9.67	26.55	33.40	41.30	52.30	67.75	95.20
5 × 16	10.00	27.50	34.55	42.80	54.10	70.05	98.50
5 × 17	10.33	28.40	35.70	44.20	55.90	72.40	101.80
5 × 18	10.67	29.30	36.85	45.60	57.70	74.75	105.00
5 × 19	11.00	30.25	38.00	47.00	59.50	77.05	108.30
5 × 20	11.33	31.15	39.15	48.50	61.30	79.40	111.60
6 × 6	7.00	19.20	24.10	29.85	37.70	48.80	68.70
6 × 7	7.33	20.10	25.25	31.30	39.50	51.15	72.00
6 × 8	7.67	21.00	26.40	32.70	41.30	53.45	75.20
6 × 9	8.00	21.95	27.55	34.10	43.10	55.80	78.50
6 × 10	8.33	22.85	28.70	35.50	44.90	58.15	81.80
6 × 11	8.67	23.75	29.85	37.00	46.70	60.45	85.00
6 × 12	9.00	24.70	31.00	38.40	48.50	62.80	88.30
6 × 13	9.33	25.60	32.15	39.80	50.30	65.15	91.60
6 × 14	9.67	26.50	33.30	41.20	52.10	67.45	94.80
6 × 15	10.00	27.45	34.45	42.70	53.90	69.80	98.10
6 × 16	10.33	28.35	35.60	44.10	55.70	72.15	101.40
6 × 17	10.67	29.25	36.75	45.50	57.50	74.45	104.60
6 × 18	11.00	30.20	37.90	46.90	59.30	76.80	107.90
6 × 19	11.33	31.10	39.05	48.40	61.10	79.15	111.20
6 × 20	11.67	32.00	40.20	49.80	62.90	81.45	114.40
7 × 7	7.67	21.00	26.40	32.70	41.30	53.45	75.20
7 × 8	8.00	21.90	27.55	34.10	43.10	55.80	78.50
7 × 9	8.33	22.85	28.70	35.50	44.90	58.15	81.80
7 × 10	8.67	23.75	29.85	37.00	46.70	60.45	85.00
7 × 11	9.00	24.70	31.00	38.40	48.50	62.80	88.30
7 × 12	9.33	25.60	32.15	39.80	50.30	65.15	91.60
7 × 13	9.67	26.50	33.30	41.20	52.10	67.45	94.80
7 × 14	10.00	27.45	34.45	42.70	53.90	69.80	98.10
7 × 15	10.33	28.35	35.60	44.10	55.70	72.15	101.40
7 × 16	10.67	29.25	36.75	45.50	57.50	74.45	104.60
7 × 17	11.00	30.20	37.90	46.90	59.30	76.80	107.90
7 × 18	11.33	31.10	39.05	48.40	61.10	79.15	111.20
7 × 19	11.67	32.00	40.20	49.80	62.90	81.45	114.40
7 × 20	12.00	32.95	41.35	51.20	64.70	83.80	117.70
8 × 8	8.33	22.80	28.65	35.40	44.80	58.00	81.50
8 × 9	8.67	23.70	29.80	36.90	46.60	60.35	84.80
8 × 10	9.00	24.65	30.95	38.30	48.40	62.70	88.00
8 × 11	9.33	25.55	32.10	39.70	50.20	65.00	91.30
8 × 12	9.67	26.45	33.25	41.20	52.00	67.35	94.60
8 × 13	10.00	27.40	34.40	42.60	53.80	69.70	97.90
8 × 14	10.33	28.30	35.55	44.00	55.60	72.00	101.10
8 × 15	10.67	29.20	36.70	45.40	57.40	74.35	104.40
8 × 16	11.00	30.15	37.85	46.90	59.20	76.70	107.70
8 × 17	11.33	31.05	39.00	48.30	61.00	79.00	110.90
8 × 18	11.67	31.95	40.15	49.70	62.80	81.35	114.20
8 × 19	12.00	32.90	41.30	51.10	64.60	83.65	117.50
8 × 20	12.33	33.80	42.45	52.60	66.40	86.00	120.80
9 × 9	9.00	24.60	30.90	38.20	48.30	62.60	87.90
9 × 10	9.33	25.50	32.05	39.60	50.10	64.90	91.20
9 × 11	9.67	26.40	33.20	41.10	51.90	67.25	94.40
9 × 12	10.00	27.35	34.35	42.50	53.70	69.60	97.70
9 × 13	10.33	28.25	35.50	43.90	55.50	71.90	101.00
9 × 14	10.67	29.15	36.65	45.30	57.30	74.25	104.20
9 × 15	11.00	30.10	37.80	46.80	59.10	76.60	107.50
9 × 16	11.33	31.00	38.95	48.20	60.90	78.90	110.80
9 × 17	11.67	31.90	40.10	49.60	62.70	81.25	114.00
9 × 18	12.00	32.85	41.25	51.00	64.50	83.60	117.30
9 × 19	12.33	33.75	42.40	52.50	66.30	85.90	120.60
9 × 20	12.67	34.65	43.55	53.90	68.10	88.25	123.90
10 × 10	9.67	26.40	33.20	41.10	51.90	67.25	94.40
10 × 11	10.00	27.35	34.35	42.50	53.70	69.60	97.70
10 × 12	10.33	28.25	35.50	43.90	55.50	71.90	101.00
10 × 13	10.67	29.15	36.65	45.30	57.30	74.25	104.20
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10 × 15	11.33	31.00	38.95	48.20	60.90	78.90	110.80
10 × 16	11.67	31.90	40.10	49.60	62.70	81.25	114.00
10 × 17	12.00	32.85	41.25	51.00	64.50	83.60	117.30
10 × 18	12.33	33.75	42.40	52.50	66.30	85.90	120.60
10 × 19	12.67	34.65	43.55	53.90	68.10	88.25	123.90
10 × 20	13.00	35.60	44.70	55.30	69.90	90.60	127.20
11 × 11	10.33	28.25	35.50	43.90	55.50	71.90	101.00
11 × 12	10.67	29.15	36.65	45.30	57.30	74.25	104.20
11 × 13	11.00	30.10	37.80	46.80	59.10	76.60	107.50
11 × 14	11.33	31.00	38.95	48.20	60.90	78.90	110.80
11 × 15	11.67	31.90	40.10	49.60	62.70	81.25	114.00
11 × 16	12.00	32.85	41.25	51.00	64.50	83.60	117.30
11 × 17	12.33	33.75	42.40	52.50	66.30	85.90	120.60
11 × 18	12.67	34.65	43.55	53.90	68.10	88.25	123.90
11 × 19	13.00	35.60	44.70	55.30	69.90	90.60	127.20
11 × 20	13.33	36.50	45.85	56.70	71.70	92.95	130.50
12 × 12	11.00	30.10	37.80	46.80	59.10	76.60	107.50
12 × 13	11.33	31.00	38.95	48.20	60.90	78.90	110.80
12 × 14	11.67	31.90	40.10	49.60	62.70	81.25	114.00
12 × 15	12.00	32.85	41.25	51.00	64.50	83.60	117.30
12 × 16	12.33	33.75	42.40	52.50	66.30	85.90	120.60
12 × 17	12.67	34.65	43.55	53.90	68.10	88.25	123.90
12 × 18	13.00	35.60	44.70	55.30	69.90	90.60	127.20
12 × 19	13.33	36.50	45.85	56.70	71.70	92.95	130.50
12 × 20	13.67	37.40	47.00	58.20	73.50	95.30	133.80
13 × 13	11.67	31.90	40.10	49.60	62.70	81.25	114.00
13 × 14	12.00	32.85	41.25	51.00	64.50	83.60	117.30
13 × 15	12.33	33.75	42.40	52.50	66.30	85.90	120.60
13 × 16	12.67	34.65	43.55	53.90	68.10	88.25	123.90
13 × 17	13.00	35.60	44.70	55.30	69.90	90.60	127.20
13 × 18	13.33	36.50	45.85	56.70	71.70	92.95	130.50
13 × 19	13.67	37.40	47.00	58.20	73.50	95.30	133.80
13 × 20	14.00	38.35	48.15	59.60	75.30	97.65	137.10
14 × 14	12.33	33.75	42.40	52.50	66.30	85.90	120.60
14 × 15	12.67	34.65	43.55	53.90	68.10	88.25	123.90
14 × 16	13.00	35.60	44.70	55.30	69.90	90.60	127.20
14 × 17	13.33	36.50	45.85	56.70	71.70	92.95	130.50
14 × 18	13.67	37.40	47.00	58.20	73.50	95.30	133.80
14 × 19	14.00	38.35	48.15	59.60	75.30	97.65	137.10
14 × 20	14.33	39.25	49.30	61.00	77.10	100.00	140.40
15 × 15	13.00	35.60	44.70	55.30	69.90	90.60	127.20
15 × 16	13.33	36.50	45.85	56.70	71.70	92.95	130.50
15 × 17	13.67	37.40	47.00	58.20	73.50	95.30	133.80
15 × 18	14.00	38.35	48.15	59.60	75.30	97.65	137.10
15 × 19	14.33	39.25	49.30	61.00	77.10	100.00	140.40
15 × 20	14.67	40.15	50.45	62.40	78.90	102.35	143.70
16 × 16	13.67	37.40	47.00	58.20	73.50	95.30	133.80
16 × 17	14.00	38.35	48.15	59.60	75.30	97.65	137.10
16 × 18	14.33	39.25	49.30	61.00	77.10	100.00	140.40
16 × 19	14.67	40.15	50.45	62.40	78.90	102.35	143.70
16 × 20	15.00	41.10	51.60	63.90	80.70	104.70	147.00
17 × 17	14.33	39.25	49.30	61.00	77.10	100.00	140.40
17 × 18	14.67	40.15	50.45	62.40	78.90	102.35	143.70
17 × 19	15.00	41.10	51.60	63.90	80.70	104.70	147.00
17 × 20	15.33	42.00	52.75	65.30	82.50	107.05	150.30
18 × 18	15.00	41.10	51.60	63.90	80.70	104.70	147.00
18 × 19	15.33	42.00	52.75	65.30	82.50	107.05	150.30
18 × 20	15.67	42.90	53.90	66.70	84.30	109.40	153.60
19 × 19	15.67	42.90	53.90	66.70	84.30	109.40	153.60
19 × 20	16.00	43.85	55.05	68.20	86.10	111.75	156.90
20 × 20	16.33	44.75	56.20	69.60	87.90	114.10	160.20

DUCTS AND FLUES—Area and Weight of Ducts. | No. 11-F

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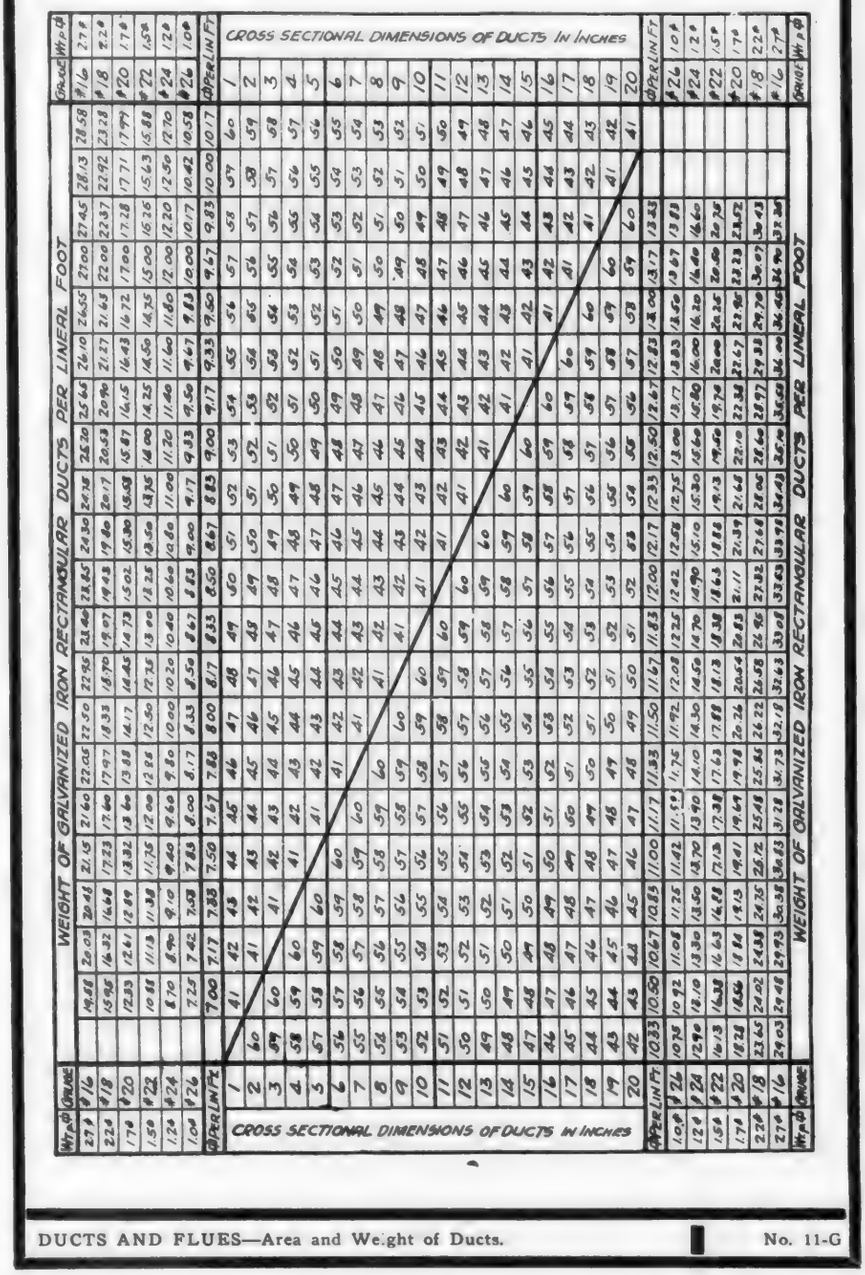
THE HEATING AND VENT[illegible] MAGAZINE -1123 BROADWAY, N. Y. CITY

TABLES FOR VENTILATING DUCTS.

Superficial Area and Weight of Galvanized Sheet Iron Rectangular Ducts.


WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT
CROSS SECTIONAL DIMENSIONS OF DUCTS IN INCHES
Wt. per Sq. Ft.
Gauge
Per Lin. Ft.
WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT
CROSS SECTIONAL DIMENSIONS OF DUCTS IN INCHES

DUCTS AND FLUES—Area and Weight of Ducts. No. 11-G

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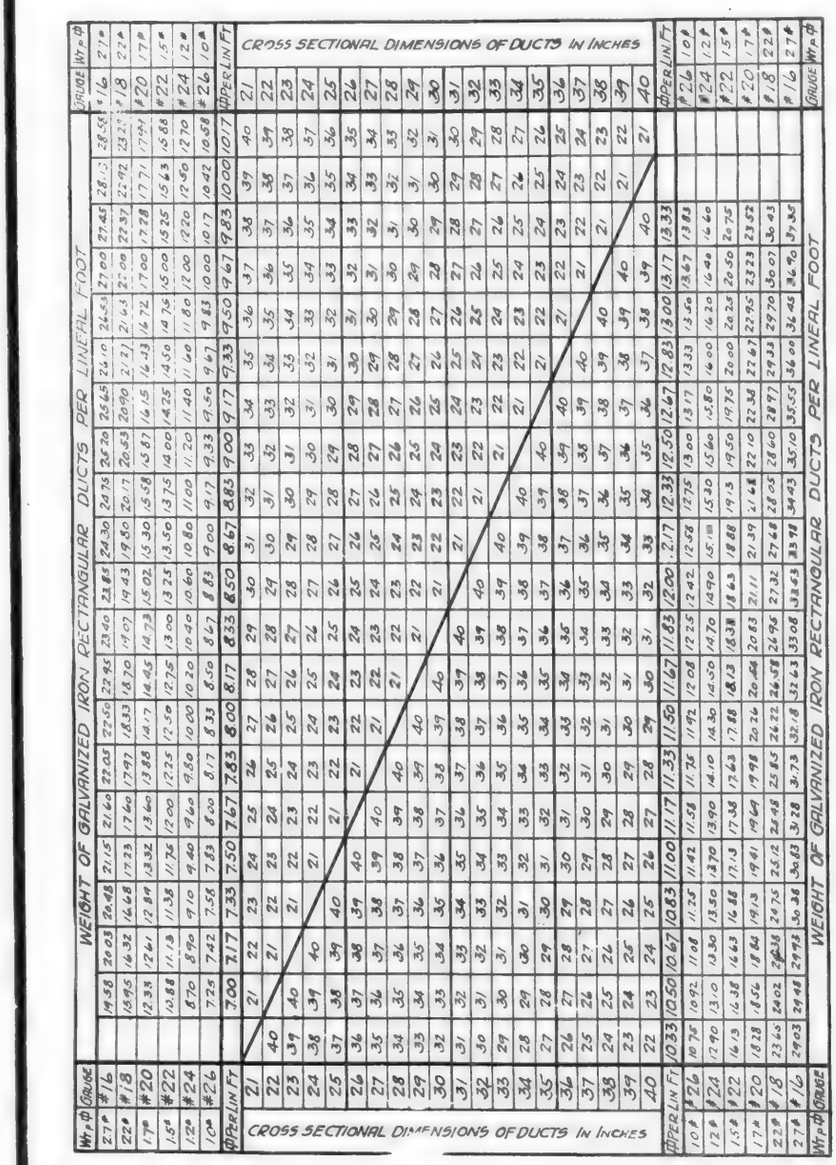
TABLES FOR VENTILATING DUCTS.

Superficial Area and Weight of Galvanized Sheet Iron Rectangular Ducts.



DUCTS AND FLUES—Area and Weight of Ducts. | No. 11-H

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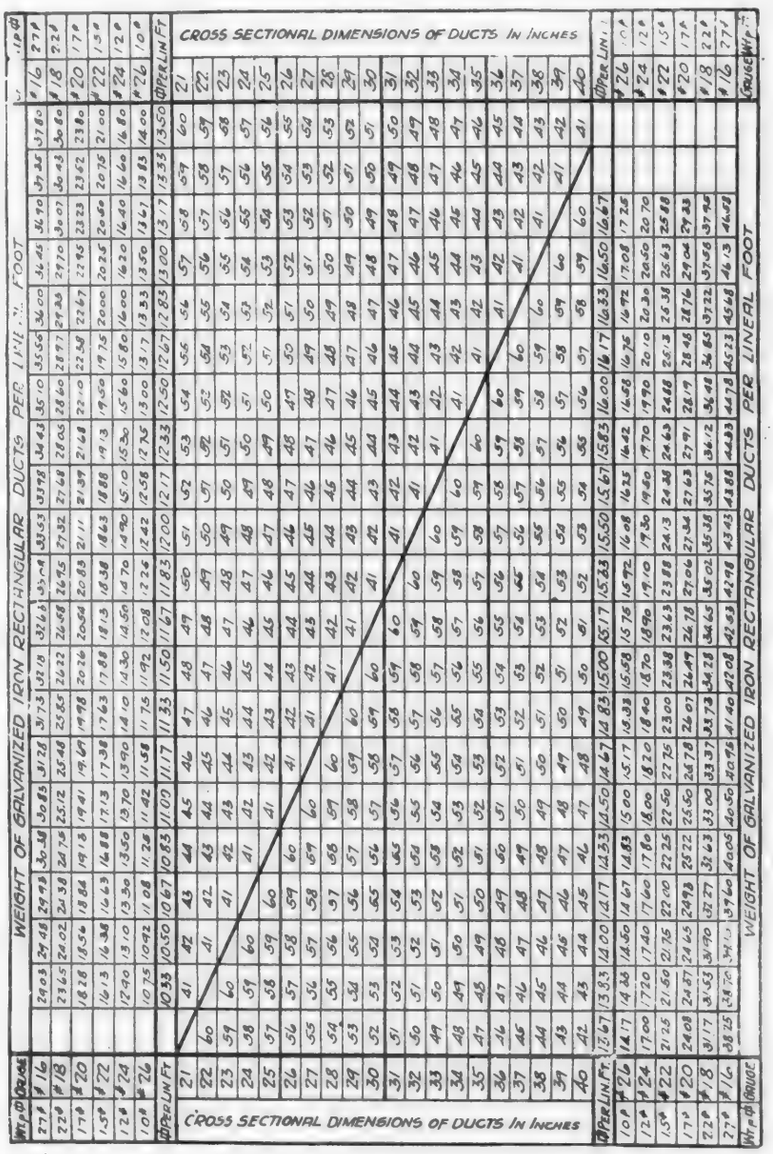
TABLES FOR VENTILATING DUCTS.

Superficial Area and Weight of Galvanized Sheet Iron Rectangular Ducts.



DUCTS AND FLUES—Area and Weight of Ducts. No. 11-I

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THE MOST ECONOMICAL AIR COMPRESSOR AND VACUUM PUMP

NASH HYTOR

THE HYTOR COMPRESSOR is valveless, has no gears, loose moving or reciprocating parts, no piston packing to renew, no cylinders to lubricate and no bearing adjustments to make.

The rotor, the only moving part, is cast in one piece, the blades being rigidly reinforced by shrouds. The rotor is mounted on a short, stiff shaft supported at each end by the highest grade annular ball bearings mounted outside of the casing.

As the peripheral clearance is large, there is no possibility of the ends of the rotor blades coming in contact with the casing.

The original high efficiency is maintained indefinitely in continuous service.

The air is thoroughly washed during compression and contains no oil.

Hytor compressors occupy very much less floor space and are much lighter in weight than reciprocating compressors. They run without vibration.

The cost of installation is greatly reduced as no expensive foundations are necessary.

No expert attendance is required as there are no adjustments to make. The cost of upkeep is negligible.

Hytor compressors are quiet in operation

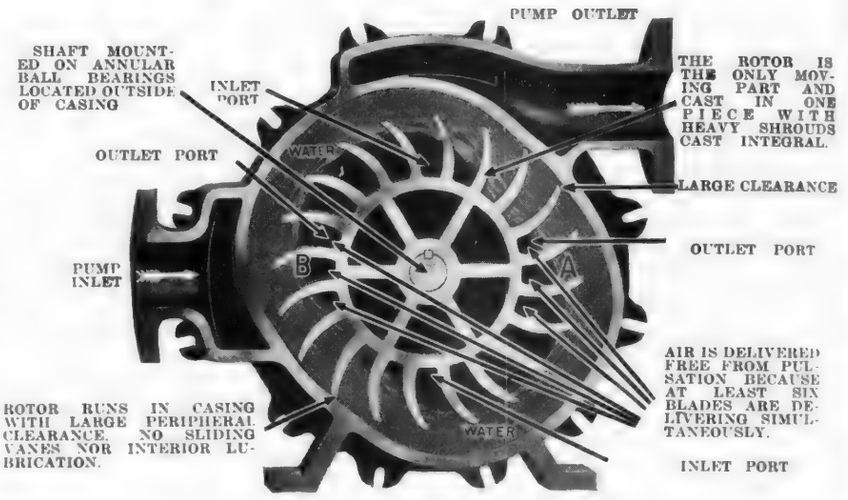
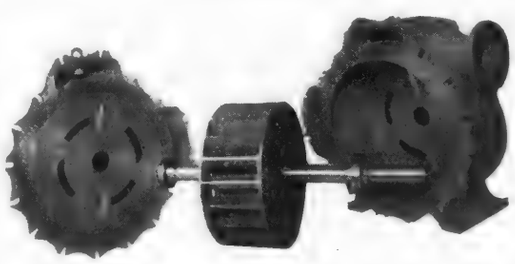

PUMP OUTLET
SHAFT MOUNTED ON ANNULAR BALL BEARINGS LOCATED OUTSIDE OF CASING
INLET PORT
THE ROTOR IS THE ONLY MOVING PART AND CAST IN ONE PIECE WITH HEAVY SHROUDS CAST INTEGRAL.
OUTLET PORT
WATER
LARGE CLEARANCE
OUTLET PORT
PUMP INLET
B
A
AIR IS DELIVERED FREE FROM PULSATION BECAUSE AT LEAST SIX BLADES ARE DELIVERING SIMULTANEOUSLY.
ROTOR RUNS IN CASING WITH LARGE PERIPHERAL CLEARANCE. NO SLIDING VANES NOR INTERIOR LUBRICATION.
WATER
INLET PORT

Diagram illustrating unique principle of operation



All the parts of the Hytor

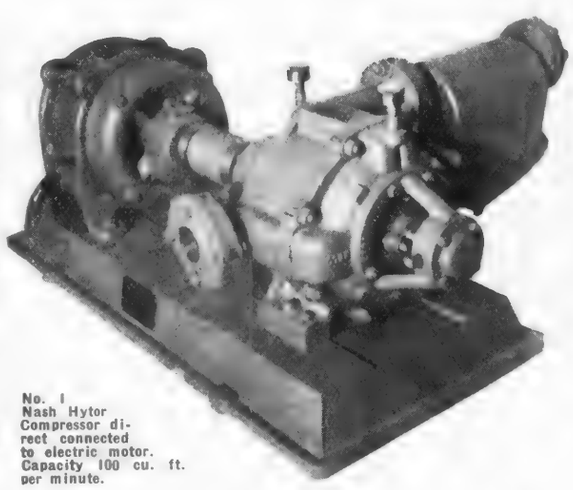
A ROTOR in hydraulic balance revolves freely in an elliptical casing filled with water. The water, turning, with the rotor, and constrained to follow the casing by contrifugal force, alternately recedes from and is forced back into the rotor, twice in a revolution. As the water recedes from the rotor it draws in air through the inlet ports. When the water is forced back into the rotor by the converging casing, the air is first compressed and then discharged through the outlet ports.

This celluloid graphic device with movable rotor clearly illustrates the operating principle. Send for your copy.

At pressures up to and including 15 lbs. per square inch, and vacuums up to 20 inches of mercury, the Nash Hytor affords the simplest and most economical means for handling air or gas, for all of the usual purposes where air under pressure is required, and they can be used on many special services for which the ordinary compressor is not adapted.

It is common practice in handling mildly acid vapors to re-circulate thru the pump an alkaline solution for the protection of the cast iron structure of the pump. In handling chlorine gas, concentrated sulphuric acid is re-circulated.

Air handled by the Hytor is delivered absolutely clean and free from dust or oil: a great advantage in the agitation of good products or in absorption processes where diffusion of air is accomplished by blowing thru filters, porus blankets or small orifices.



No. 1 Nash Hytor Compressor direct connected to electric motor. Capacity 100 cu. ft. per minute.

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Please send graphic device also bulletins covering

- ☐ Hytor Air Compressors
- ☐ Hytor Vacuum Pumps
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- ☐ Boiler Feed Pumps

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COMPANY .....
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NASH ENGINEERING CO.

SOUTH NORWALK, CONN., U. S. A.

Trade and Miscellaneous Notes

Coming Events.

April 16-18, 1923—Pacific coast regional meeting of American Society of Mechanical Engineers in Los Angeles, Cal.

April 18-19, 1923—Annual meeting of the National Metal Trades Association, at the Hotel Astor, New York.

April 30-May 1-2, 1923—Spring meeting of American Society of Refrigerating Engineers, in St. Louis, Mo.

May 7-9, 1923—Annual convention of American Association of Engineers in Norfolk, Va.

May 14-16, 1923—Annual meeting of the National Pipe and Supplies Association, at the Gibson Hotel, in Cincinnati, O.

May 20-23, 1923—Semi-annual meeting of the American Society of Heating and Ventilating Engineers, in Chicago.

May 23-26, 1923—Thirty-fourth annual convention of the Heating and Piping Contractors' National Association at the Hotel Drake, in Chicago.

May 28-31, 1923—Spring meeting of American Society of Mechanical Engineers in Montreal, Canada.

June 4-6, 1923—Thirty-fifth annual convention of American Boiler Manufacturers' Association in Hot Springs, Va.

June 20-23, 1923.—Fourteenth annual meeting of the National District Heating Association at Cedar Point, O.

June 26-28, 1923—Forty-first annual convention of the National Association of Master Plumbers in Atlantic City, N. J. Headquarters at the Breakers Hotel.

September 10-13, 1923—Eighteenth annual meeting of the American Society of Sanitary Engineers, at the Hotel Blackhawk, in Davenport, Ia.

Miscellaneous Notes.

Bankers Economic Service, Inc., which furnishes its clients with regular and special bulletins covering fundamental business factors, has purchased *The Industrial Digest* and in future will issue the magazine monthly in addition to continuing its special service to clients. The new publishers have retained the old staff and in addition have added a research staff of economists. It is their belief that hundreds of business men to whom the cost of a special service was prohibitive, can now be reached by issuing the desired information in the form of a magazine.

Eastern Supply Association held its winter meeting at the Hotel Astor in New York February 11. Nineteen new members were added and four resignations from members who had gone out of business were reported. Among those elected to membership were: Fred Adee Corporation, Cornell & Underhill, and E. F. Keating Co., all of New York. Frank H. Shevit, an income tax counsellor, made an interesting talk in which he urged the keeping of records to facilitate preparation of income tax returns, particularly as to deductible items. The proper time to prepare for the income tax return, he said, is at the beginning of the year, not the end. The report of the association's Credit Bureau showed good progress, listing to date 12,023 claims and $1,270,000 as the amount paid. Another interesting talk was that of William J. Woolley, manager of the National Trade Extension Bureau, on the apprenticeship question and the work of the Trade Extension Bureau. Mr. Woolley pointed out that while journeymen were passing out of

Three famous fans

There are three famous fans that figure in this country of ours—the movie fan, the baseball fan and the Autovent Fan. To you, the one of most importance is the Autovent Fan. It is the fan necessary to your work, it is the fan that enters upon your daily professional and business activity.

And for years those in the ventilating field have known the Autovent Motor Driven Propeller Fan for its efficiency and adaptability to seemingly impossible conditions. They have also known it for neatness in appearance and ease of installation. And knowing its good points they have specified it, as thousands of installations show.

The Autovent Fan has solved many ventilating problems. It can solve yours.

AUTOVENT FAN & BLOWER COMPANY

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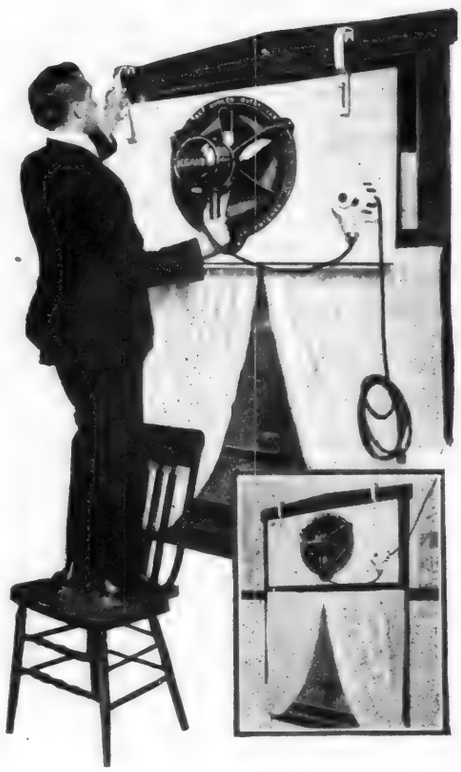
the trade by death and other causes at the rate of 4,000 a year, their places are being filled only at the rate of about 3,600 a year.

Boston, Mass.—New officers, directors and standing committees were elected at a meeting of the Heating and Piping Contractors Association of Boston at Young's Hotel February 27, as follows: President, Ralph S. Franklin; vice-president, P. J. McMurrer; treasurer, W. T. Smallman; clerk, C. W. Sisson; directors, H. E. Barber, M. E. Chase, W. S. Cousens, F. S. Cleghorn, F. A. Merrill and William H. Oakes.

Building Activity in February was greater than that of the corresponding month of any previous year, according to the F. W. Dodge Corporation. Total construction contracts awarded during the month in 36 eastern States aggregated $281,140,000. Figures for the 27 States which are comparable show an increase over February 1922 of 33%. Of the contracts awarded, $113,902,000 or 40% was for residential building; 14% each for industrial and public works or utilities; 12% for business buildings; and 10% each for educational buildings and miscellaneous construction. While the volume of building was large throughout the country, it was relatively larger in the south and west than in the east. Available reports show the activity divided as follows: New England, $14,627,000; New York and Northern New Jersey, $57,702,000; Middle Atlantic States, $29,107,000; Southern states, $51,202,000; Pittsburgh district, $44,086,000; Central west, $73,996,000; and Northwest, $10,419,000.

Arbitration Society of America has arranged for the co-operation of trade organizations and commercial associations in observing "Arbitration Educational Week" May 14 to 20, 1923. During that week friends of arbitration are expected to join in an intensive campaign to inform the people of the benefits of arbitration in general and of the practical results to be obtained by taking advantage of the arbitration law of New York in particular. Less than 2% of the ten million people in New York State, it is said, know anything about the arbitration law, whereby business disputes may be settled without the delays and excessive cost of litigation. Charles L. Bernheimer,



THE NEW PORTABLE ILGAIR VENTILATOR

HERE'S another Ilg development—the **Ilgair Portable Panel**—just the thing for homes, offices, stores, hotels, etc., where a permanent installation is not desirable.

It's the greatest idea for 1923. Fits any window—can be installed in a jiffy. No screws or nails required—simply hang it like a picture on the wall, then make connection with a nearby lamp socket, and the job is done.

MADE IN THREE SIZES TO TAKE CARE OF WINDOWS RANGING FROM 25" TO 48" WIDER IF NECESSARY AT ONE COST—NO EXTRAS

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They are fool proof and very simple, so stay in operating condition.

They are effective, removing from the air 90% of the germs and pailfuls of filth each week.

They require little attention. Flushing to sewer and cleaning once a week is sufficient.

Without obligating you our Engineers will help solve your problems by bringing a wealth of information gained during two score years' leadership.

Write us today to Dept. No. 36.

Carrier Air Conditioning Company of America

480 Broadway, Buffalo, N. Y., U. S. A.

known as the Father of the arbitration law of New York State, is chairman of the committee in charge of the week's activities.

Central Heating, Ventilation and Solid Fuel Committee of the British Empire Exhibition has been strengthened by the addition of several new members, including Captain H. Riall Sankey, (Deputy Chairman); Walter Yates, J. L. Musgrave, Frank Biggin, Oswald Stott, Prof. A. H. Barker (also a member of the gas committee), and S. Naylor. The possibility of testing boilers, etc., at the exhibition and the making of awards on the same is being made the subject of an investigation by Messrs. Biggin and Yates, members of the council of the (British) Institution of Heating and Ventilating Engineers. They were directed to inquire of the council of the institution if it would be willing to collaborate with the exposition authorities in carrying out tests on exhibits of heating and ventilating appliances from both British and colonial sources.

Cama, Norton & Co., Bombay, India, importers of electrical machinery, plants, devices and appliances, announce that the firm is interested in obtaining catalogs of and corresponding wtih American manufacturers. The firm reports that India in general and Bombay, in particular, has large openings for engineering enterprise.

New York.—"Should there be a runaway labor market in 1923," states Samuel B. Donnelly, secretary of the Building Trades Employers' Association, "the responsibility will rest mainly upon the owners and operators who will bring it about by bidding against each other for the available supply of labor."

W. Nelson Haden, and his son, George Haden, of Trowbridge, England, who have been in this country on a business trip and who attended the annual meeting of the American Society of Heating and Ventilating Engineers, in Washington, in January, returned to England February 24 on the S. S. Celtic.

National Safety Council's Engineering Section will hold a mid-year conference in the office of the Western Society of Engineers, 55 Jackson Boulevard, Chicago, April 17. Topics on the program include: preventing dust fires and explosions; health protection against dust; causes of accidents in handling materials; and general discussions of specific safety problems.

Racine, Wis.—Seven Racine firms have formed a local Heating and Piping Contractors' Association as a result of the efforts of Edward Sullivan, of Kenosha, president of the State association. The members are: Feichter & Netzinger, Advance Heating Co., Wiertz & Hughes Heating Co., James Sinollen, Albert Brunk, and Donehue Sprinkler Co. A. H. Thomas was elected president, J. J. Wiertz, secretary, and William Netzinger, treasurer.

United States has assumed a leading position among all nations in volume and variety of its manufactured production, in the number of wage earners engaged in manufacturing, in the power applied to manufacturing processes, and in the value of manufactured products, according to a report issued by National Industrial Conference Board. The greatest growth was in the five years from 1914 to 1919. The total value of products manufactured in the United States rose between 1849 and 1919 from $1,091,000,000 to nearly $62,500,000,000, and the number of wage earners from 957,059 to 9,096,372, the report states.

Arthur D. Little, Inc., Cambridge, Mass., has announced the addition to its organization of Alfred I. Phillips, as gas engineer. Mr. Phillips formerly was associate gas engineer of the National Bureau of Standards and for a time was service engineer of the American Gas Association.

"Transportation" and "Europe and Europe's Affairs" are the two chief topics to be considered at the eleventh

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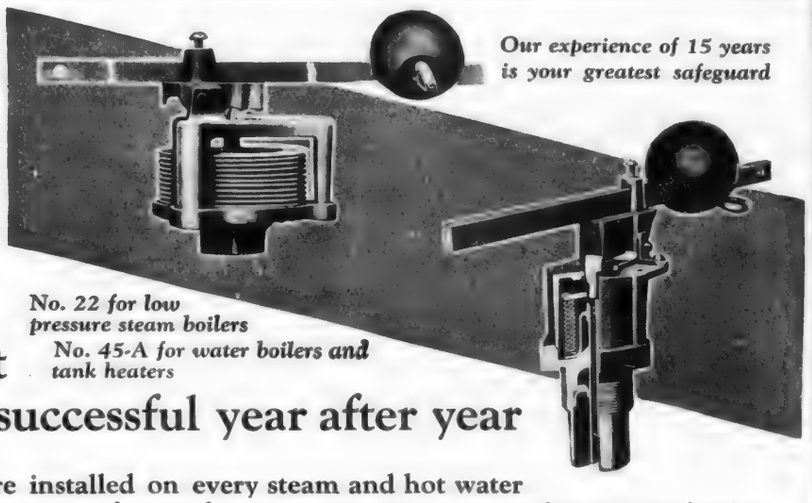
Our experience of 15 years is your greatest safeguard



No. 22 for low pressure steam boilers

No. 45-A for water boilers and tank heaters

Damper Regulators make your steam and hot water heating jobs successful year after year

If Sylphon Damper Regulators are installed on every steam and hot water job you have, there will be no question of your future reputation or your client's satisfaction. For you will give him a heating system that keeps the house evenly heated—never overheated, never underheated, always just right.

As installed in hundreds of thousands of Hot Water Supply systems during the past 15 years.

Accurate, Positive and Long Life Regulation

There is a great difference in regulators. Ordinary regulators have either rubber, metal or soldered diaphragms. None of these types is as sensitive, positive in action, or of such long life as the Sylphon Regulator, because it contains the SYLPHON Bellows—that seamless, solderless, flexible, all-metal expansion member, which is the heart of all Sylphon products. Its extreme flexibility (expands and contracts largely upon the slightest change in steam pressure or temperature) opens and closes the draft smoothly, positively, accurately.

Do not accept imitations or substitutes.

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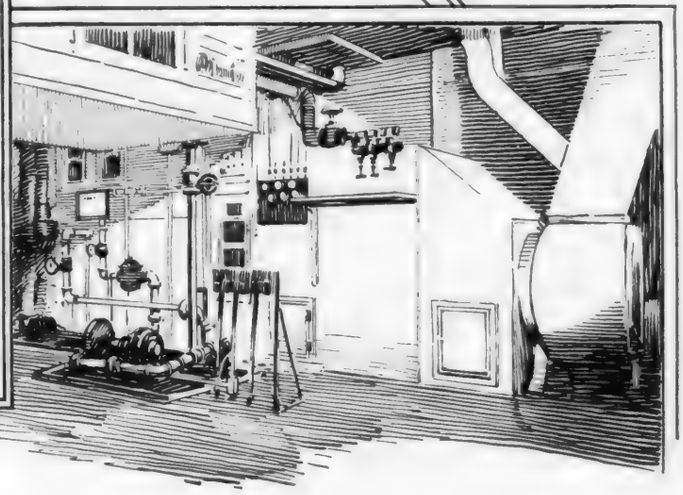

Woodbury County Court House, Sioux City, Iowa. Wm. L. Steele, Sioux City, Iowa, Architect; LaVelle & Hogan, Sioux City, Iowa, Heating & Ventilating Contractors; Purcell & Elmslie, Chicago, Associate Architects.

Use Air Washing Equipment That Will Safeguard Your Reputation

Have you ever considered the part that efficient ventilating and air washing apparatus plays in the maintenance of your reputation as an architect, engineer or contractor?

Such equipment insures clean, showy interiors, free from dust and dirt, that impress observers with the thoroughness and foresight of the designer and builder.

American Blower Fans and Air Washing equipment are more than a recognized standard. Certain exclusive features of construction have caused leading architects and engineers to regard it as highly superior. These features are fully covered in descriptive bulletins that will be gladly sent upon request.

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FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT

annual meeting of the Chamber of Commerce of the United States to be held in New York, May 7 to 10. Aspects of transportation which will be discussed include: governmental relations to transportation, railroad consolidation, rate schedule adjustments, and co-ordination of motor transport and waterway carriers. The European discussion will cover such subjects as raparations, war debts, and currency depreciation.

National Fire Protection Association committee will recommend adoption of a sub-committee report on "proposed regulations for the installation of pulverized-fuel systems" at the annual meeting of the association in Chicago in May. The report has been approved by the main committee on dust-explosion hazards. The proposed regulations cover both the installation and operation of pulverized-fuel equipment.

Two Central Topics will be developed on the program of the tenth annual Foreign Trade Council in New Orleans May 2-4. The first subject will be Europe's ability to buy American goods, and the other, ways and means to cheapen and perfect movement of exports and imports between the central United States and the seaboard. Among the important papers to be presented are: "Trading in the Face of Depressed Exchange" "Foreign Piracy of American Trade Marks," "Most Promising Marketing Prospects," "Scientific Reduction of Transportation Costs," and "Export Advertising."

Chicago—An advanced type of garage construction is provided in plans being drawn by David Saul Klafter, architect, for Max J. Crocker, Samuel Kracow, and Morris Gerber in Chicago. The three men have purchased a lot, 100 by 200 ft. at 4117-25 Broadway where they plan the erection of one of the largest garages in the city. The building will be of fireproof construction, two stories high, and will have besides the garage, two stores, an automobile show room, and fourteen offices. A modern ventilating system will be installed to provide fresh air to all parts of the building, and another innovation is provided in chauffeurs' clubrooms, equipped with billiard tables, showers and lockers. This is planned for the use of chauffeurs of private cars who will use the clubrooms as headquarters while awaiting employers' calls. The cost of building and land is fixed at $275,000.

Arthur T. St. Laurent, chief engineer of the Department of Public Works, has been elected president of The Engineering Institute of Canada for the year 1923. Mr. St. Laurent entered the public service soon after graduation as a civil engineer, and has successively held important posts in the department until his elevation as chief a year ago. He was a vice-president of the Institute in 1915, 1916 and 1917. He is a member of the American Society of Civil Engineers and the International Congress of Navigation.

Manufacturers' Notes.

Pierce, Butler & Pierce Mfg. Corporation, New York, has appointed K. P. Gordon manager of its detroit branch. Mr. Gordon has been a salesman at the Detroit branch for the past year and a half. Previous to the war he was connected with the Kansas City Credit Men's Association as manager of the interchange bureau. He was also for a time secretary of the Oklahoma City Credit Men's Association. The corporation has also appointed E. T. McCormack manager of its Pittsburgh branch. Mr. McCormack was previously connected with the Newark (N. J.) office.

Boiler and Radiator Corporation, Rochester, N. Y., has opened a branch office in Buffalo, N. Y. William Harper, for a number of years connected with the American Radiator Company, will have charge of the Buffalo office, which is located at 409 Lafayette Building.

Herman Nelson Corporation, Moline, Ill., announces the removal of its Rochester, N. Y., branch from 422 Arlington building to 511 Duffy-Powers building.

Richardson & Boynton Co., New York, has moved its Philadelphia branch from 1332 Arch St., to larger quarters at 1308 Arch St.

Iowa Ventilator Co., Waterloo, Ia., has moved its offices from the Fowler building to larger quarters in the Knights of Pythias building.

PUBLIC SCHOOL No. 62, BRONX, New York City, N. Y.
Over one Hundred Lehigh Fans are installed in New York City Schools

LEHIGH MULTIBLADE FANS

FOR HEATING AND VENTILATING

WHERE large volumes of air are to be handled at comparatively low pressures such as in heating and ventilating systems LEHIGH Multiblade Fans are guaranteed to be equal to, if not superior, to any other fans on the market.

HERSH BROTHERS CO.

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Peerless Ventilator

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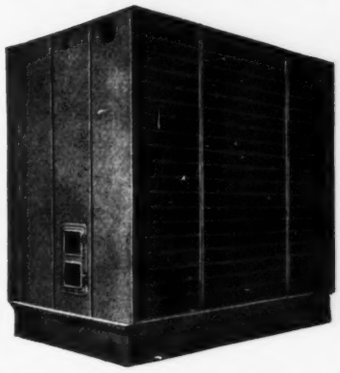
The New York Blower Co.

Chicago, Ill. **La Porte, Ind.**



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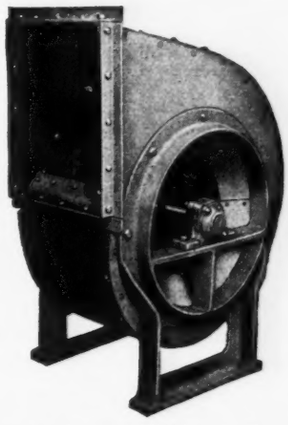
We manufacture a complete line of fan equipment and appurtenances. By concentrating on this one class of products we are able to make them better every year.

Pulley Driven Disc Fan for Mines

The old fallacy that fan equipment was a luxury is now known to be untrue; it is an economical necessity. We can give actual installations in all kinds of industries where through the wise employment of fan equipment manufacturers have improved the quality of their product, and increased production with a reduction in factory cost.



Type "C" Seri-Vane Fan

If you are interested in drying, humidifying, heating, ventilating, mechanical draft, removal of shavings or similar installations, please communicate with us. If we cannot honestly prove facts to you showing the benefits that will follow from an installation for your special problem, we will frankly so state.

Motor Driven Propeller Fan

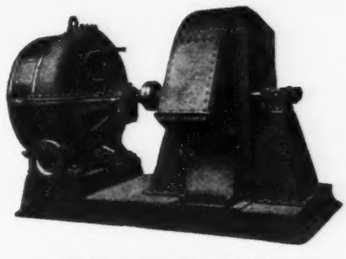
Slow Speed Planing Mill Exhauster

The New York Blower Co.

Chicago, Ill. **La Porte, Ind.**

Branch Offices in Principal Cities

High Speed Type "C" Seri-Vane Fan



High Pressure Blower Direct Connected to Turbine

Stoker Fan

Sprague Electric Works of General Electric Company, New York, announces the consolidation of its district and local offices with corresponding offices of the General Electric Co., effective April 1, 1923. The manufacture and exploitation of Sprague products will be continued in the name of the General Electric Co., in the recently organized Merchandise Department. The Sprague Conduit Products Section and the Sprague Apparatus Section of the Merchandise Department will, for the present, continue offices at 527 West 34th St., New York.

Stuart Root, who for many years was connected with The Central Foundry Company, is now vice-president of the Central Radiator Co., an associated company. Mr. Root is giving his time to the supervision of both production and sales of the Central Radiator Company's well-known line of boilers and radiators.

Fitzgibbons Boiler Co., Inc., Oswego, N. Y. is building three fireproof additions to its plant, including new stock rooms, pattern and storage shop and a complete power house. The plants also are being equipped with motorized boiler-making machinery. The capacity of the company will be more than doubled by the additions and improvements.

Valve Engineering Co., formerly located in Somerville, Mass., has moved its plant and offices to 66-72 Hamilton St., Cambridge, Mass.

Walworth Manufacturing Co., Boston, is making improvements to its foundry to cost $40,000, including a one-story addition to its foundry, equipped with five new annealing furnaces, three presses and an assorting table.

Sheffler-Gross Co., Philadelphia, Pa., sales engineers for heating and power equipment, announces that P. D. Rech, formerly with the H. S. B. W.-Cochrane Corporation, is now connected with the Sheffler-Gross Company as sales engineer.

Utica Heater Co., Utica, N. Y., announces the opening of a new branch office in Detroit, Mich., in charge of Howard V. Linhard. Mr. Linhard has had several years' sales experience with the Super-smokeless boilers, which is the company's principal product. The new Detroit office is located at 1265 Griswold Street.

American Blower Co., Detroit, Mich., announces a general advance in the prices of its products, effective April 1. The increase, it is stated, is necessary, due to increasing costs of labor and materials.

Monitor Bi-Loop Radiator Co., Lancaster, Pa., is building an addition to its plant to increase which will be devoted exclusively to the manufacture of boilers.

United States Radiator Corporation, Detroit, Mich., has placed the new additions, to its plant at Corry, Pa., consisting of foundry, machine shops and corerooms, in operation. The improvements triple the capacity of the Corry plant.

Hoffman Specialty Co., Waterbury, Conn., had a number of representatives of other manufacturing concerns as guests at its recent annual salesmen's meeting. Company salesmen from Chicago, Minneapolis, New York, Boston, Kansas City, Erie and Wilkes-Barre, Pa., and Knoxville, Tenn., were present. Sessions were presided over by President George D. Hoffman, and Vice-Presidents Charles V. Haynes, Philadelphia and E. S. Storm, Chicago.

Grinnell Company of the Pacific, Los Angeles, Cal., has purchased 2½ acres of land centrally located in Los Angeles, Cal., and will erect a new plant for the use of the Los Angeles branch. Russell Grinnell, general manager, visited the coast for the purpose of purchasing the new site.

Pierce, Butler & Pierce Mfg. Corporation, New York, has purchased the plant and business of the Federal Radiator Co., in Zanesville, O. The plant will be operated as a branch factory. The purchase price is reported to be about $500,000.

Central Station Heating Notes.

Salt Lake City, Utah.—Successful operation of the new unit South Temple plant of the Utah Power & Light Co. has led to plans by the company to connect the pipes of this plant with those of its Newhouse plant so that it may completely serve the business district. The company now steam heats about 75 of the largest buildings, supplying about 34,000,000 cu. ft. out of a total of 100,000,000 cu. ft. of building space in the business section. Substitution of a central heating plant is believed to offer ultimate solution of the smoke nuisance. The new boiler was given a thorough test during the coldest weather and was found to operate successfully without smoke.

Virginia, Minn.—Plans to extend the present central heating system to include the South side residential district are being prepared by the city council. A fourth heating zone, the piping of which will cost $150,000, probably will be laid out during the summer. The municipality already has spent $750,000 on its central heating system.

Pittsburgh, Pa.—The Allegheny Steam Heating Co., a subsidiary of the Philadelphia Co., has announced plans for a central heating plant to heat Pittsburgh office buildings. Automatic delivery of coal at a central station, direct by a fleet of barges from the mouths of the mines, and insulated underground steam tunnels are economic features of the plan, which has the approval of the city administration as a step in combating the smoke nuisance.

New Incorporations

E. Arnold Co.—Auburn, Me., capital $50,000. Officers: E. A. Arnold, president; Clarence C. Arnold, treasurer; and George A. Arnold, secretary. The company will conduct a heating and plumbing business.

Beggs Engineering Co., Inc., Hartford, Conn., capital $500,000. Incorporators: T. R. Beggs, B. J. Smith, and J. H. Kane. The company will manufacture valves and heating specialties.

A LOCALIZED VENTILATING SYSTEM WITH A

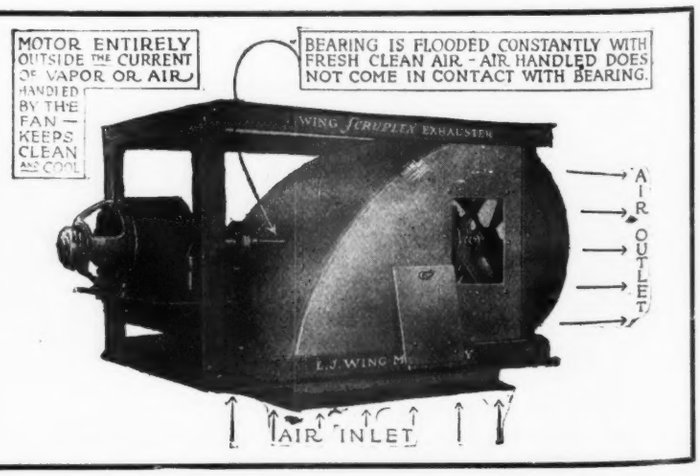
WING-SCRUPLEX EXHAUSTER

REG. U.S. PAT. OFF.

is the most effective method of keeping the air in your plant pure. THE WING EXHAUSTER exhausts the heat, smoke, steam, grease, vapors, fumes, etc., *directly* from the machines, vats, ranges, or processes, etc. It carries these elements off from their point of origin before they have a chance to spread and contaminate the air. Let us explain how the *Wing Scruplex Exhauster* is doing this for hundreds of satisfied users.
Write for our recommendations and illustrations of typical installations.

L. J. Wing Mfg. Co.

FANS & BLOWERS
UNIT HEATERS
DAMPER REGULATORS
SMALL TURBINE
Hudson & 13th St. NEW YORK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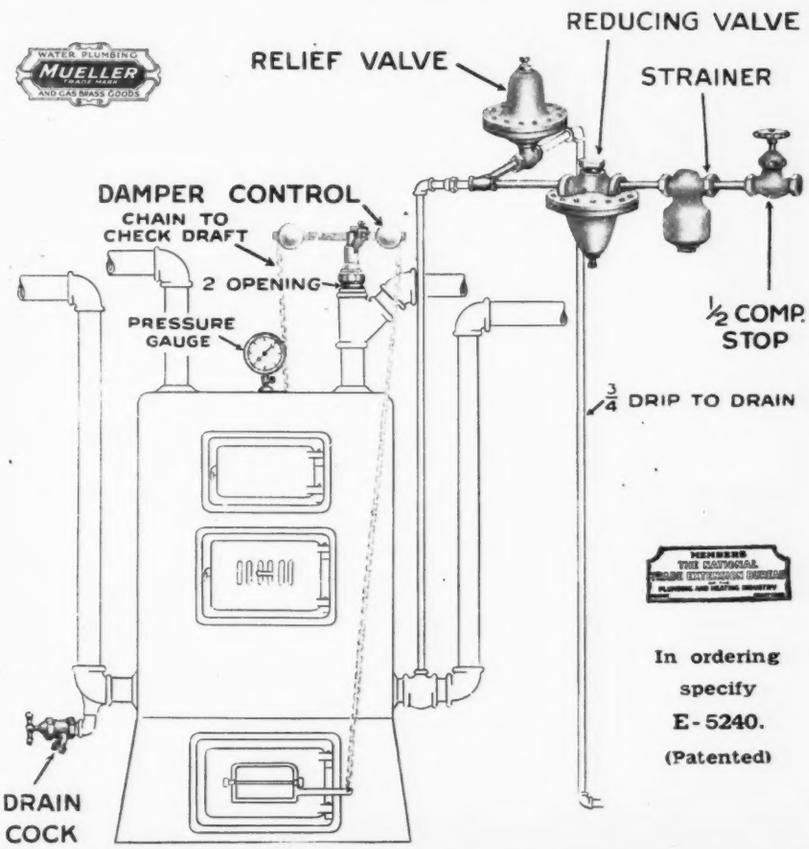

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Mueller Automatic System of Hot Water Heat Control

comes already assembled—requires one hour to install—can be set for any desired temperature—has no expansion tank—requires no care—gives no trouble—gives you a good profit and gives your customer absolute satisfaction.

Write for descriptions and prices.

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Water, Plumbing and Gas Brass Goods and Tools
New York City, 145 W. 30th St. Phone Penn. 2468
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San Francisco, 635 Mission St Phone Sutter 3577
Mueller Metals Co., Port Huron, Mich., Makers of "Red Tip" Brass Rod; Welding Rod; Brass and Copper Tubing; Forgings and Castings in Brass and Bronze; also Brass Screw Machined Products.

Federal Pipe & Supply Co., Toledo, Ohio, capital $50,000. Incorporators: Louis F. Schroeder, George G. Barnes, James S. Leonard, E. Schroeder, and Ellsworth M. Beard.

Hamburg Boiler Works, Hamburg, Pa., capital $60,000. The company will take over the business formerly conducted under the same name. The management remains unchanged.

Sunbeam Heating Co., 1123 West 37th St., Chicago, capital $10,000. Incorporators: Matthew Blomer, Robert G. Evans, Eugene M. Weiderman, and Frank L. Rosenfelder. The company will manufacture and deal in furnaces and ventilating accessories. Correspondent, Francis E. Cracarkin, 1617 Ashland Block.

Heggie Simplex Boiler Co., 1708 Collins St., Joilet, Ill., capital $150,000. Incorporators: John F. Heggie, Thomas M. Heggie and Charles A. Russell. The company will manufacture boilers, garbage burners and tanks.

Pottstown Heater & Supply Co., Wilmington, Del., capital $100,000. The company will manufacture heating and plumbing specialties.

Sauer Plumbing & Heating Co., Park Ridge, Ill., capital $2,500. Incorporators: Sylvia Sauer, William J. Sauer, and Adelaide H. Wail.

Contracts Awarded.

Sacramento, Cal.—Bids were received as follows for the heating and ventilating of the new Sacramento high school: Luppen & Hawley, $59,090; Hateley & Hateley, $56,518: and Latourrette-Fical Company, $57,300.

Knox Plumbing and Heating Co., Mount Vernon, O., heating new combination junior high school and grade school in Massillon, O., for $28,650; also plumbing contract, amounting to $11,560.

Fox & Co., Kelso, Wash., heating and plumbing for new Cowlitz county court house in Kelso for $12,350.

Eckart Plumbing & Heating Co., Seattle Wash., heating and plumbing new Butterworth mortuary in Seattle.

Gowans-Hailey Co., Nashville, Tenn., heating new Memorial building in Victory park, Nashville. The completed building will cost $150,000.

James Smith Heating & Plumbing Co., Spokane, Wash., heating and plumbing for the United States Vetrans' Hospital at American Lake for $300,000.

Pacific Electrical Manufacturing Co., San Francisco, Cal., electric steam heating new office building being erected by the Contra Costa Builders Exchange in Richmond, Cal.

Dooley, Kewanee, Ill., heating and plumbing for the new Community high school in Galesburg, Ill., for $16,007.

Sanitary Plumbing & Heating Co., Muscatine, Ia., heating new home of Young Woman's Christian Association in Muscatine, Ia.

David Landers, Boston, Mass., heating and plumbing the new $500,000 Victor Kaufman theatre and business building at Mattapan, Mass.

B. McKenzie, Greenboro, N. C., heating the North Carolina State Hospital for Colored Insane near Goldsboro, N. C.

Buckingham & Routh, New Haven, Conn., heating the new athletic building to be erected in connection with Yale bowl at Yale University.

Libby & Blinn, Inc., Hartford, Conn., heating and ventilating new nine-story fireproof bank and office building to be erected for Phoenix National Bank of Hartford at cost of $650,000.

M. A. Dame & Son Co., Boston, Mass., heating the new $1,200,000 Junior high school in Dorcester, Mass.

Wilson Heating Co., Washington, Ia., heating, ventilating and plumbing new consolidated high school in Wapello for $23,771.

American Foundry & Furnace Co., Bloomginton, Ill., heating and ventilating New Oak Park School in Aurora for $20,004; the plumbing contract went to the Dooley & Bruning Co., at its bid of $14,600.

City Plumbing & Heating Co., Boulder, Colo., heating and ventilating new North Side Junior School, in Boulder, for $20,560; also plumbing same building for $11,339.

Business Chances.

Fremont, Neb.—Contract was awarded January 20 to Davis & Wilson, of Lincoln, for the plans of Midland College's building expansion which will include a gymnasium, central heating plant and dormitories.

Galveston, Texas.—A cooling-heating system, to cost $40,000, will be installed in the city auditorium. The building seats 5,000 people and has been referred to as "the city's barn," on the ground that it is not adequately heated.

Los Angles, Cal.—Construction was expected to commence in March on an eight-story and basement Class A physicians' and surgeons' office building at Westlake Avenue and Orange Street, Los Angeles, by the Wholesale Properties Corporation, 908 Nuys Building, to cost $500,000. Architect, Charles S. McKenzie, San Jose. General contractor, Wallace & Bush.

Alton, Mo.—A resolution favoring a central heating, water and light plant for the Missouri School for Deaf and the Fulton State Hospital was adopted at a meeting of the board of managers of the School for Deaf, on January 26. According to the resolution, the plant will be located between the two institutions and will furnish heat, water and light to each of the institutions, "the cost of such service to be prorated on a meter basis as determined by the cost of fuel and labor." A committee composed of C. O. McName, president of the School for Deaf, Ross R. Wagner and Superintendent E. S. Tillinghast, was appointed to present the matter to the legislature. The estimated cost of the plant is between $100,000 and $125,000. It is believed that one plant serving both institutions will save about $9,000 a year in operating expenses.

Chicago, Ill.—Dwight P. Robinson & Co., New York, has started work on additions to the plant of the Miehle Printing Press & Mfg. Co., at 14th and Robey Streets, Chicago. Three new buildings will be erected on the west side of Robey Street and connected by a bridge to the present plant. A three-story and basement building of flat-slab concrete construction, 80 ft. x 200 ft., will be the largest unit.

San Antonio, Texas.—A $27,300 steam heating plant will be installed in the Southwest State Insane Asylum building. A Dallas firm was the successful bidder against four competitors. The steam line system of the asylum will be overhauled under a separate contract as soon as the present heating season ends.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

POSITION WANTED.—Executive now employed in the East desires position as manager with a heating and sprinkler concern. Experienced in engineering, selling, buying and shop management. If you are looking for a young energetic man who can produce results, address Box 43, care of Heating and Ventilating Magazine.

SALESMEN WANTED.—High-grade salesmen who are calling on plumbing, heating and hardware trade, to sell best gas steam radiator made. Big commission and real money maker. Williams made $395.00 first week. Address Box 44, care of Heating and Ventilating Magazine.

WANTED.—Live heating engineer and specialty man to manage heating specialty business in New England. Must be willing to invest sufficient capital to insure his active personal interest. Good opportunity for right party. Applicant must have A1 references as to character, habits, etc. Address Box 42, care of Heating and Ventilating Magazine.

DRAFTSMAN WANTED.—Draftsman wanted not over 30 years old. Excellent prospects for advancement. Small concern. Must have heating and ventilating or blower experience. Location, Chicago. Address Box 60, care of Heating and Ventilating Magazine.

BRANCH OFFICE WANTED—Capable, energetic heating and ventilating engineer seeks connection as representative of heating and power house specialties. 15 years' experience in the mechanical equipment of industrial plants, power and boiler houses, office buildings, hotels, hospitals, theatres, school buildings, etc. Best references. Address Box 84, care of Heating and Ventilating Magazine.